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|---|--|--|---|
| (51) International Patent Classification ⁶ : C12N 15/12, C07K 14/47, C12N 5/10, G01N 33/68, A61K 38/17, 48/00 | | A2 | (11) International Publication Number: WO 97/39122 (43) International Publication Date: 23 October 1997 (23.10.97) |
| (21) International Application Number: PCT/US97/06042 | | (81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). | |
| (22) International Filing Date: 11 April 1997 (11.04.97) | | Published <i>Without international search report and to be republished upon receipt of that report.</i> | |
| (30) Priority Data: 08/631,184 12 April 1996 (12.04.96) US | | | |
| (60) Parent Application or Grant (63) Related by Continuation US 08/631,184 (CIP) Filed on 12 April 1996 (12.04.96) | | | |
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| (54) Title: ISOLATED AND CLONED MAST CELL 78 kDa PHOSPHOPROTEIN (MAST CELL DEGRANULATION INHIBITORY AGENT) AND USE THEREOF | | | |
| (57) Abstract | | | |
| <p>A 78 kDa mast cell protein (moesin) has been cloned from rats, and its cDNA and amino acid sequence determined. This protein is phosphorylated on specific serine and threonine residues by the action in mast cells of one or more protein kinase C isozymes, especially the ξ isozyme, thereby producing a phosphoprotein that inhibits mast cell degranulation (Mast Cell Degranulation Inhibitor Agent). <i>In vivo</i> phosphorylation of this protein in mast cells can be stimulated by drugs such as cromolyn, nedocromil, flavonoids such as quercetin and kaempferol, and Iodoxamide. Mast cell degranulation can be inhibited by administration of phosphomoesin phosphatase inhibitors. Tissues deficient in mast cell moesin can be identified with a labeled anti-moesin or anti-phosphomoesin antibody and treated by transfecting such mast cells with moesin cDNA in a viral vector such as an influenza virus vector.</p> | | | |
| <p style="text-align: center;">size (kb) —————— 0.0 1.0 1.5 2.0 3.0 4.0</p> <p>RM1 ——————</p> <p>RM3 ——————</p> <p>RM4 ——————</p> <p>RM5 ——————</p> <p>RM6 ——————</p> <p>RM7 ——————</p> <p>RM9 ——————</p> <p>Whole Gene —————— coding region</p> | | | |

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ISOLATED AND CLONED MAST CELL 78 kDa PHOSPHOPROTEIN (MAST CELL DEGRANULATION INHIBITORY AGENT) AND USE THEREOF

5

FIELD OF THE INVENTION

The present invention provides novel proteins, along with therapeutic, diagnostic and research utilities for these proteins.

BACKGROUND OF THE INVENTION

10 Technology aimed at the discovery of protein factors (including e.g., cytokines, such as lymphokines, interferons, CSFs and interleukins) has matured rapidly over the past decade. The now routine hybridization cloning and expression cloning techniques clone novel polynucleotides "directly" in the sense that they rely on information directly related to the discovered protein (i.e., partial DNA/amino acid sequence of the protein in the case 15 of hybridization cloning; activity of the protein in the case of expression cloning). More recent "indirect" cloning techniques such as signal sequence cloning, which isolates DNA sequences based on the presence of a now well-recognized secretory leader sequence motif, as well as various PCR-based or low stringency hybridization cloning techniques, have advanced the state of the art by making available large numbers of DNA/amino acid 20 sequences for proteins that are known to have biological activity by virtue of their secreted nature in the case of leader sequence cloning, or by virtue of the cell or tissue source in the case of PCR-based techniques. It is to these proteins that the present invention is directed.

SUMMARY OF THE INVENTION

25 In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:1;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID 30 NO:1 from nucleotide 70 to nucleotide 505;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AP162 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AP162 deposited under accession number ATCC 98026 ;

(e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AP162 deposited under accession number ATCC 98026 ;

5 (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AP162 deposited under accession number ATCC 98026 ;

(g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:2;

(h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:2 having biological activity;

10 (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and

(j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:1

15 from nucleotide 70 to nucleotide 505; the nucleotide sequence of the full length protein coding sequence of clone AP162 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AP162 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AP162
20 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:2 from amino acid 42 to amino acid 61.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group
25 consisting of:

(a) the amino acid sequence of SEQ ID NO:2;

(b) the amino acid sequence of SEQ ID NO:2 from amino acid 42 to amino acid 61;

(c) fragments of the amino acid sequence of SEQ ID NO:2; and

30 (d) the amino acid sequence encoded by the cDNA insert of clone AP162 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:2 or the amino acid sequence of SEQ ID NO:2 from amino acid 42 to amino acid 61.

5 In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:4;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:4 from nucleotide 230 to nucleotide 791;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:4 from nucleotide 311 to nucleotide 791;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AM931 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AM931 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AM931 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AM931 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:5;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:5 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

30 Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:4 from nucleotide 230 to nucleotide 791; the nucleotide sequence of SEQ ID NO:4 from nucleotide 311 to nucleotide 791; the nucleotide sequence of the full length protein coding sequence of clone AM931 deposited under accession number ATCC 98026 ; or the

nucleotide sequence of the mature protein coding sequence of clone AM931 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AM931 deposited under accession number ATCC 98026 . In yet other preferred embodiments,
5 such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:5 from amino acid 32 to amino acid 51.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- 10 (a) the amino acid sequence of SEQ ID NO:5;
(b) the amino acid sequence of SEQ ID NO:5 from amino acid 32 to amino acid 51;
(c) fragments of the amino acid sequence of SEQ ID NO:5; and
(d) the amino acid sequence encoded by the cDNA insert of clone
15 AM931 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:5 or the amino acid sequence of SEQ ID NO:5 from amino acid 32 to amino acid 51.

In one embodiment, the present invention provides a composition comprising an
20 isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:6;
(b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:6 from nucleotide 14 to nucleotide 491;
25 (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:6 from nucleotide 83 to nucleotide 491;
(d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AM610 deposited under accession number ATCC 98026 ;
30 (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AM610 deposited under accession number ATCC 98026 ;
(f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AM610 deposited under accession number ATCC 98026 ;

(g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AM610 deposited under accession number ATCC 98026 ;

(h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:7;

5 (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:7 having biological activity;

(j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and

10 (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:6 from nucleotide 14 to nucleotide 491; the nucleotide sequence of SEQ ID NO:6 from nucleotide 83 to nucleotide 491; the nucleotide sequence of the full length protein coding sequence of clone AM610 deposited under accession number ATCC 98026 ; or the 15 nucleotide sequence of the mature protein coding sequence of clone AM610 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AM610 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:7 20 from amino acid 31 to amino acid 50.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

(a) the amino acid sequence of SEQ ID NO:7;

25 (b) the amino acid sequence of SEQ ID NO:7 from amino acid 31 to amino acid 50;

(c) fragments of the amino acid sequence of SEQ ID NO:7; and

(d) the amino acid sequence encoded by the cDNA insert of clone AM610 deposited under accession number ATCC 98026;

30 the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:7 or the amino acid sequence of SEQ ID NO:7 from amino acid 31 to amino acid 50.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:9;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:9 from nucleotide 1 to nucleotide 483;
- 5 (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AM340 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AM340 deposited under accession number ATCC 98026 ;
- 10 (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AM340 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AM340 deposited under accession number ATCC 98026 ;
- 15 (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:10;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:10 having biological activity;
- (i) a polynucleotide which is an allelic variant of a polynucleotide of
20 (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.
- Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:9 from nucleotide 1 to nucleotide 483; the nucleotide sequence of the full length protein
25 coding sequence of clone AM340 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AM340 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AM340 deposited under accession number ATCC 98026 . In yet other preferred embodiments,
30 such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:10 from amino acid 124 to amino acid 143.
- In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:10;
- (b) the amino acid sequence of SEQ ID NO:10 from amino acid 124 to amino acid 143;
- (c) fragments of the amino acid sequence of SEQ ID NO:10; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AM340 deposited under accession number ATCC 98026;
- the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:10 or the amino acid sequence of SEQ ID NO:10 from amino acid 124 to amino acid 143.
- 10 In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:
- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:11;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:11 from nucleotide 15 to nucleotide 462;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:11 from nucleotide 87 to nucleotide 462;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AM282 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AM282 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AM282 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AM282 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:12;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:12 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and

(k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:11 from nucleotide 15 to nucleotide 462; the nucleotide sequence of SEQ ID NO:11 from nucleotide 87 to nucleotide 462; the nucleotide sequence of the full length protein coding sequence of clone AM282 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AM282 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AM282 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:12 from amino acid 28 to amino acid 47.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:12;
- (b) the amino acid sequence of SEQ ID NO:12 from amino acid 28 to amino acid 47;
- (c) fragments of the amino acid sequence of SEQ ID NO:12; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AM282 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:12 or the amino acid sequence of SEQ ID NO:12 from amino acid 28 to amino acid 47.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:14;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:14 from nucleotide 185 to nucleotide 519;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:14 from nucleotide 260 to nucleotide 519;

(d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AK647 deposited under accession number ATCC 98026 ;

5 (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AK647 deposited under accession number ATCC 98026 ;

(f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AK647 deposited under accession number ATCC 98026 ;

10 (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AK647 deposited under accession number ATCC 98026 ;

(h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:15;

(i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:15 having biological activity;

15 (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and

(k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:14 from nucleotide 185 to nucleotide 519; the nucleotide sequence of SEQ ID NO:14 from nucleotide 260 to nucleotide 519; the nucleotide sequence of the full length protein coding sequence of clone AK647 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AK647 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AK647 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:15 from amino acid 27 to amino acid 46.

In other embodiments, the present invention provides a composition comprising a 30 protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

(a) the amino acid sequence of SEQ ID NO:15;

(b) the amino acid sequence of SEQ ID NO:15 from amino acid 27 to amino acid 46;

(c) fragments of the amino acid sequence of SEQ ID NO:15; and
(d) the amino acid sequence encoded by the cDNA insert of clone AK647 deposited under accession number ATCC 98026;
the protein being substantially free from other mammalian proteins. Preferably such protein 5 comprises the amino acid sequence of SEQ ID NO:15 or the amino acid sequence of SEQ ID NO:15 from amino acid 27 to amino acid 46.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:17;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:17 from nucleotide 257 to nucleotide 536;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:17 from nucleotide 329 to nucleotide 536;
- 15 (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AK583 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AK583 deposited under accession number ATCC 98026 ;
- 20 (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AK583 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AK583 deposited under accession number ATCC 98026 ;
- 25 (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:18;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:18 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of 30 (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:17 from nucleotide 257 to nucleotide 536; the nucleotide sequence of SEQ ID NO:17

from nucleotide 329 to nucleotide 536; the nucleotide sequence of the full length protein coding sequence of clone AK583 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AK583 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide 5 encodes the full length or mature protein encoded by the cDNA insert of clone AK583 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:18 from amino acid 14 to amino acid 33.

In other embodiments, the present invention provides a composition comprising a 10 protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:18;
 - (b) the amino acid sequence of SEQ ID NO:18 from amino acid 14 to amino acid 33;
 - 15 (c) fragments of the amino acid sequence of SEQ ID NO:18; and
 - (d) the amino acid sequence encoded by the cDNA insert of clone AK583 deposited under accession number ATCC 98026;
- the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:18 or the amino acid sequence of SEQ 20 ID NO:18 from amino acid 14 to amino acid 33.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:20;
- 25 (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:20 from nucleotide 179 to nucleotide 476;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AK533 deposited under accession number ATCC 98026 ;
- 30 (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AK533 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AK533 deposited under accession number ATCC 98026 ;

(f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AK533 deposited under accession number ATCC 98026 ;

(g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:21;

5 (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:21 having biological activity;

(i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and

10 (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:20 from nucleotide 179 to nucleotide 476; the nucleotide sequence of the full length protein coding sequence of clone AK533 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AK533 15 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AK533 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:21 from amino acid 35 to amino acid 57.

20 In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

(a) the amino acid sequence of SEQ ID NO:21;

(b) the amino acid sequence of SEQ ID NO:21 from amino acid 35 to 25 amino acid 57;

(c) fragments of the amino acid sequence of SEQ ID NO:21; and

(d) the amino acid sequence encoded by the cDNA insert of clone AK533 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein 30 comprises the amino acid sequence of SEQ ID NO:21 or the amino acid sequence of SEQ ID NO:21 from amino acid 35 to amino acid 57.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:23;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:23 from nucleotide 220 to nucleotide 612;
- 5 (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:23 from nucleotide 328 to nucleotide 612;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AK296 deposited under accession number ATCC 98026 ;
- 10 (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AK296 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AK296 deposited under accession number ATCC 98026 ;
- 15 (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AK296 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:24;
- 20 (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:24 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.
- 25 Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:23 from nucleotide 220 to nucleotide 612; the nucleotide sequence of SEQ ID NO:23 from nucleotide 328 to nucleotide 612; the nucleotide sequence of the full length protein coding sequence of clone AK296 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AK296 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AK296 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:24 from amino acid 81 to amino acid 90.
- 30

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:24;
- 5 (b) the amino acid sequence of SEQ ID NO:24 from amino acid 81 to amino acid 90;
- (c) fragments of the amino acid sequence of SEQ ID NO:24; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AK296 deposited under accession number ATCC 98026;
- 10 the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:24 or the amino acid sequence of SEQ ID NO:24 from amino acid 81 to amino acid 90.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- 15 (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:26;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:26 from nucleotide 58 to nucleotide 655;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone H617 deposited under accession number ATCC 98026 ;
- 20 (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone H617 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone H617 deposited under accession number ATCC 98026 ;
- 25 (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone H617 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:27;
- 30 (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:27 having biological activity;
- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and

- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:26 from nucleotide 58 to nucleotide 655; the nucleotide sequence of the full length 5 protein coding sequence of clone H617 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone H617 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone H617 deposited under accession number ATCC 98026 . In yet other preferred 10 embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:27 from amino acid 65 to amino acid 84.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- 15 (a) the amino acid sequence of SEQ ID NO:27;
(b) the amino acid sequence of SEQ ID NO:27 from amino acid 65 to amino acid 84;
(c) fragments of the amino acid sequence of SEQ ID NO:27; and
(d) the amino acid sequence encoded by the cDNA insert of clone 20 H617 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:27 or the amino acid sequence of SEQ ID NO:27 from amino acid 65 to amino acid 84.

In one embodiment, the present invention provides a composition comprising an 25 isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:29;
(b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:29 from nucleotide 14 to nucleotide 391;
30 (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone BB9 deposited under accession number ATCC 98026 ;
(d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone BB9 deposited under accession number ATCC 98026 ;

- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone BB9 deposited under accession number ATCC 98026 ;
 - 5 (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone BB9 deposited under accession number ATCC 98026 ;
 - (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:30;
 - (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:30 having biological activity;
 - 10 (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
 - (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.
- Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:29 from nucleotide 14 to nucleotide 391; the nucleotide sequence of the full length protein coding sequence of clone BB9 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone BB9 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone BB9 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:30 from amino acid 75 to amino acid 94.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:30;
- (b) the amino acid sequence of SEQ ID NO:30 from amino acid 75 to amino acid 94;
- (c) fragments of the amino acid sequence of SEQ ID NO:30; and
- 30 (d) the amino acid sequence encoded by the cDNA insert of clone BB9 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:30 or the amino acid sequence of SEQ ID NO:30 from amino acid 75 to amino acid 94.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:32;
- 5 (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:32 from nucleotide 61 to nucleotide 514;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:32 from nucleotide 115 to nucleotide 514;
- (d) a polynucleotide comprising the nucleotide sequence of the full 10 length protein coding sequence of clone AW191 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AW191 deposited under accession number ATCC 98026 ;
- 15 (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AW191 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AW191 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid 20 sequence of SEQ ID NO:33;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:33 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- 25 (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:32 from nucleotide 61 to nucleotide 514; the nucleotide sequence of SEQ ID NO:32 from nucleotide 115 to nucleotide 514; the nucleotide sequence of the full length protein 30 coding sequence of clone AW191 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AW191 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AW191 deposited under accession number ATCC 98026 . In yet other preferred embodiments,

such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:33 from amino acid 24 to amino acid 43.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group 5 consisting of:

- (a) the amino acid sequence of SEQ ID NO:33;
- (b) the amino acid sequence of SEQ ID NO:33 from amino acid 24 to amino acid 43;
- (c) fragments of the amino acid sequence of SEQ ID NO:33; and
- 10 (d) the amino acid sequence encoded by the cDNA insert of clone AW191 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:33 or the amino acid sequence of SEQ ID NO:33 from amino acid 24 to amino acid 43.

15 In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:35;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID 20 NO:35 from nucleotide 180 to nucleotide 525;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:35 from nucleotide 339 to nucleotide 525;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AT211 deposited under accession number 25 ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AT211 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AT211 deposited under accession number ATCC 30 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AT211 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:36;

(i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:36 having biological activity;

(j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and

5 (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID

NO:35 from nucleotide 180 to nucleotide 525; the nucleotide sequence of SEQ ID NO:35 from nucleotide 339 to nucleotide 525; the nucleotide sequence of the full length protein

10 coding sequence of clone AT211 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AT211 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AT211 deposited under accession number ATCC 98026 . In yet other preferred embodiments,

15 such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:36 from amino acid 1 to amino acid 20.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

20 (a) the amino acid sequence of SEQ ID NO:36;

(b) the amino acid sequence of SEQ ID NO:36 from amino acid 1 to amino acid 20;

(c) fragments of the amino acid sequence of SEQ ID NO:36; and

(d) the amino acid sequence encoded by the cDNA insert of clone

25 AT211 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:36 or the amino acid sequence of SEQ ID NO:36 from amino acid 1 to amino acid 20.

In one embodiment, the present invention provides a composition comprising an

30 isolated protein encoded by a polynucleotide selected from the group consisting of:

(a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:38;

(b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:38 from nucleotide 225 to nucleotide 677;

(c) a polynucleotide comprising the nucleotide sequence of SEQ ID

NO:38 from nucleotide 390 to nucleotide 677;

(d) a polynucleotide comprising the nucleotide sequence of the full

length protein coding sequence of clone AT205 deposited under accession number

5 ATCC 98026 ;

(e) a polynucleotide encoding the full length protein encoded by the

cDNA insert of clone AT205 deposited under accession number ATCC 98026 ;

(f) a polynucleotide comprising the nucleotide sequence of the mature

protein coding sequence of clone AT205 deposited under accession number ATCC

10 98026 ;

(g) a polynucleotide encoding the mature protein encoded by the cDNA

insert of clone AT205 deposited under accession number ATCC 98026 ;

(h) a polynucleotide encoding a protein comprising the amino acid

sequence of SEQ ID NO:39;

15 (i) a polynucleotide encoding a protein comprising a fragment of the
amino acid sequence of SEQ ID NO:39 having biological activity;

(j) a polynucleotide which is an allelic variant of a polynucleotide of

(a)-(g) above; and

(k) a polynucleotide which encodes a species homologue of the protein

20 of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID

NO:38 from nucleotide 225 to nucleotide 677; the nucleotide sequence of SEQ ID NO:38

from nucleotide 390 to nucleotide 677; the nucleotide sequence of the full length protein

coding sequence of clone AT205 deposited under accession number ATCC 98026 ; or the

25 nucleotide sequence of the mature protein coding sequence of clone AT205 deposited under

accession number ATCC 98026 . In other preferred embodiments, the polynucleotide

encodes the full length or mature protein encoded by the cDNA insert of clone AT205

deposited under accession number ATCC 98026 . In yet other preferred embodiments,

such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID

30 NO:39 from amino acid 6 to amino acid 25.

In other embodiments, the present invention provides a composition comprising a
protein, wherein said protein comprises an amino acid sequence selected from the group
consisting of:

(a) the amino acid sequence of SEQ ID NO:39;

(b) the amino acid sequence of SEQ ID NO:39 from amino acid 6 to amino acid 25;

(c) fragments of the amino acid sequence of SEQ ID NO:39; and

(d) the amino acid sequence encoded by the cDNA insert of clone

5 AT205 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:39 or the amino acid sequence of SEQ ID NO:39 from amino acid 6 to amino acid 25.

In one embodiment, the present invention provides a composition comprising an

10 isolated protein encoded by a polynucleotide selected from the group consisting of:

(a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:40;

(b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:40 from nucleotide 128 to nucleotide 508;

15 (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:40 from nucleotide 200 to nucleotide 508;

(d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AS34 deposited under accession number ATCC 98026 ;

20 (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AS34 deposited under accession number ATCC 98026 ;

(f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AS34 deposited under accession number ATCC 98026 ;

25 (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AS34 deposited under accession number ATCC 98026 ;

(h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:41;

(i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:41 having biological activity;

30 (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and

(k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:40 from nucleotide 128 to nucleotide 508; the nucleotide sequence of SEQ ID NO:40 from nucleotide 200 to nucleotide 508; the nucleotide sequence of the full length protein coding sequence of clone AS34 deposited under accession number ATCC 98026 ; or the 5 nucleotide sequence of the mature protein coding sequence of clone AS34 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AS34 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID 10 NO:41 from amino acid 27 to amino acid 46.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:41;
- 15 (b) the amino acid sequence of SEQ ID NO:41 from amino acid 27 to amino acid 46;
- (c) fragments of the amino acid sequence of SEQ ID NO:41; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AS34 deposited under accession number ATCC 98026;
- 20 the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:41 or the amino acid sequence of SEQ ID NO:41 from amino acid 27 to amino acid 46.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- 25 (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:43;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:43 from nucleotide 23 to nucleotide 676;
- (c) a polynucleotide comprising the nucleotide sequence of the full 30 length protein coding sequence of clone AS32 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AS32 deposited under accession number ATCC 98026 ;

(e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AS32 deposited under accession number ATCC 98026 ;

5 (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AS32 deposited under accession number ATCC 98026 ;

(g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:44;

(h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:44 having biological activity;

10 (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and

(j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID

15 NO:43 from nucleotide 23 to nucleotide 676; the nucleotide sequence of the full length protein coding sequence of clone AS32 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AS32 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of 20 clone AS32 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:44 from amino acid 78 to amino acid 97.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group 25 consisting of:

(a) the amino acid sequence of SEQ ID NO:44;

(b) the amino acid sequence of SEQ ID NO:44 from amino acid 78 to amino acid 97;

(c) fragments of the amino acid sequence of SEQ ID NO:44; and

30 (d) the amino acid sequence encoded by the cDNA insert of clone AS32 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:44 or the amino acid sequence of SEQ ID NO:44 from amino acid 78 to amino acid 97.

In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:46;
- 5 (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:46 from nucleotide 132 to nucleotide 479;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:46 from nucleotide 201 to nucleotide 479;
- (d) a polynucleotide comprising the nucleotide sequence of the full 10 length protein coding sequence of clone AR260 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AR260 deposited under accession number ATCC 98026 ;
- 15 (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AR260 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AR260 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid 20 sequence of SEQ ID NO:47;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:47 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- 25 (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:46 from nucleotide 132 to nucleotide 479; the nucleotide sequence of SEQ ID NO:46 from nucleotide 201 to nucleotide 479; the nucleotide sequence of the full length protein 30 coding sequence of clone AR260 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AR260 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AR260 deposited under accession number ATCC 98026 . In yet other preferred embodiments,

such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:47 from amino acid 40 to amino acid 59.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group 5 consisting of:

- (a) the amino acid sequence of SEQ ID NO:47;
- (b) the amino acid sequence of SEQ ID NO:47 from amino acid 40 to amino acid 59;
- (c) fragments of the amino acid sequence of SEQ ID NO:47; and
- (d) the amino acid sequence encoded by the cDNA insert of clone

10 AR260 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:47 or the amino acid sequence of SEQ ID NO:47 from amino acid 40 to amino acid 59.

15 In one embodiment, the present invention provides a composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:50;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID 20 NO:50 from nucleotide 1 to nucleotide 332;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone K640 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone K640 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone K640 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone K640 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:51;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:51 having biological activity;

(i) a polynucleotide which is an allelic variant of a polynucleotide of
(a)-(f) above; and

(j) a polynucleotide which encodes a species homologue of the protein
of (g) or (h) above.

5 Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:50 from nucleotide 1 to nucleotide 332; the nucleotide sequence of the full length protein coding sequence of clone K640 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone K640 deposited under accession number ATCC 98026 . In other preferred embodiments, the
10 polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone K640 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:51 from amino acid 11 to amino acid 30.

In other embodiments, the present invention provides a composition comprising a
15 protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

(a) the amino acid sequence of SEQ ID NO:51;
(b) the amino acid sequence of SEQ ID NO:51 from amino acid 11 to
amino acid 30;

20 (c) fragments of the amino acid sequence of SEQ ID NO:51; and
(d) the amino acid sequence encoded by the cDNA insert of clone K640 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein
comprises the amino acid sequence of SEQ ID NO:51 or the amino acid sequence of SEQ
25 ID NO:51 from amino acid 11 to amino acid 30.

In one embodiment, the present invention provides a composition comprising an
isolated protein encoded by a polynucleotide selected from the group consisting of:

(a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:54;

30 (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:54 from nucleotide 71 to nucleotide 377;

(c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone K39 deposited under accession number ATCC 98026 ;

(d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone K39 deposited under accession number ATCC 98026 ;

5 (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone K39 deposited under accession number ATCC 98026 ;

(f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone K39 deposited under accession number ATCC 98026 ;

(g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:55;

10 (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:55 having biological activity;

(i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and

15 (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:54 from nucleotide 71 to nucleotide 377; the nucleotide sequence of the full length protein coding sequence of clone K39 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone K39 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone K39 deposited under accession number ATCC 98026 . In yet other preferred embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:55 from amino acid 62 to amino acid 81.

20 25 In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

(a) the amino acid sequence of SEQ ID NO:55;

(b) the amino acid sequence of SEQ ID NO:55 from amino acid 62 to 30 amino acid 81;

(c) fragments of the amino acid sequence of SEQ ID NO:55; and

(d) the amino acid sequence encoded by the cDNA insert of clone K39 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:55 or the amino acid sequence of SEQ ID NO:55 from amino acid 62 to amino acid 81.

In one embodiment, the present invention provides a composition comprising an
5 isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:57;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:57 from nucleotide 194 to nucleotide 423;
- 10 (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AT319 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AT319 deposited under accession number ATCC 98026 ;
- 15 (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AT319 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AT319 deposited under accession number ATCC 98026 ;
- 20 (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:58;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:58 having biological activity;
- 25 (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

Preferably, such polynucleotide comprises the nucleotide sequence of SEQ ID NO:57 from nucleotide 194 to nucleotide 423; the nucleotide sequence of the full length protein coding sequence of clone AT319 deposited under accession number ATCC 98026 ; or the nucleotide sequence of the mature protein coding sequence of clone AT319 deposited under accession number ATCC 98026 . In other preferred embodiments, the polynucleotide encodes the full length or mature protein encoded by the cDNA insert of clone AT319 deposited under accession number ATCC 98026 . In yet other preferred

embodiments, such polynucleotide encodes a protein comprising the amino acid sequence of SEQ ID NO:58 from amino acid 2 to amino acid 21.

In other embodiments, the present invention provides a composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group
5 consisting of:

- (a) the amino acid sequence of SEQ ID NO:58;
- (b) the amino acid sequence of SEQ ID NO:58 from amino acid 2 to amino acid 21;
- (c) fragments of the amino acid sequence of SEQ ID NO:58; and
10 (d) the amino acid sequence encoded by the cDNA insert of clone AT319 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins. Preferably such protein comprises the amino acid sequence of SEQ ID NO:58 or the amino acid sequence of SEQ ID NO:58 from amino acid 2 to amino acid 21.

15

Protein compositions of the present invention may further comprise a
20 pharmaceutically acceptable carrier. Compositions comprising an antibody which specifically reacts with such protein are also provided by the present invention.

Methods are also provided for preventing, treating or ameliorating a medical condition which comprises administering to a mammalian subject a therapeutically effective amount of a composition comprising a protein of the present invention and a
25 pharmaceutically acceptable carrier.

BRIEF DESCRIPTION OF THE FIGURES

Fig. 1 is an autoradiograph evidencing the expression of clones AP162, AM931, and AR260 in COS cells (expressed band(s) indicated by dot(s)).

30 Fig. 2 is an autoradiograph evidencing the expression of clone AM610 in COS cells (expressed band(s) indicated by dot(s)).

Fig. 3 is an autoradiograph evidencing the expression of clones AM340, AM282 and AK533 in COS cells (expressed band(s) indicated by dot(s)).

Fig. 4 is an autoradiograph evidencing the expression of clone AK647 in COS cells (expressed band(s) indicated by dot(s)).

Fig. 5 is an autoradiograph evidencing the expression of clones AH583, AK296, and AS32 in COS cells (expressed band(s) indicated by dot(s)).

5 Fig. 6 is an autoradiograph evidencing the expression of clones H617 and AT205 in COS cells (expressed band(s) indicated by dot(s)).

Fig. 7 is an autoradiograph evidencing the expression of clones BB9 and K39 in COS cells (expressed band(s) indicated by dot(s)).

10 Fig. 8 is an autoradiograph evidencing the expression of clones AW191 and AS34 in COS cells (expressed band(s) indicated by dot(s)).

Fig. 9 is an autoradiograph evidencing the expression of clones AT211 and AT319 in COS cells (expressed band(s) indicated by dot(s)).

Fig. 10 is an autoradiograph evidencing the expression of clone K640 in COS cells (expressed band(s) indicated by dot(s)).

15

DETAILED DESCRIPTION

ISOLATED PROTEINS

Nucleotide and amino acid sequences are reported below for each clone and protein disclosed in the present application. In some instances the sequences are preliminary and may include some incorrect or ambiguous bases or amino acids. The actual nucleotide sequence of each clone can readily be determined by sequencing of the deposited clone in accordance with known methods. The predicted amino acid sequence (both full length and mature) can then be determined from such nucleotide sequence. The amino acid sequence 20 of the protein encoded by a particular clone can also be determined by expression of the clone in a suitable host cell, collecting the protein and determining its sequence.

For each disclosed protein applicants have identified what they have determined to be the reading frame best identifiable with sequence information available at the time of filing. Because of the partial ambiguity in reported sequence information, reported protein 30 sequences include "Xaa" designators. These "Xaa" designators indicate either (1) a residue which cannot be identified because of nucleotide sequence ambiguity or (2) a stop codon in the determined nucleotide sequence where applicants believe one should not exist (if the nucleotide sequence were determined definitively).

As used herein a "secreted" protein is one which, when expressed in a suitable host cell, is transported across or through a membrane, including transport as a result of signal sequences in its amino acid sequence. "Secreted" proteins include without limitation proteins secreted wholly (e.g., soluble proteins) or partially (e.g., receptors) from the cell 5 in which they are expressed. "Secreted" proteins also include without limitation proteins which are transported across the membrane of the endoplasmic reticulum.

10 Protein "AP162"

One protein of the present invention has been identified as protein "AP162". A partial cDNA clone encoding AP162 was first isolated from a human adult placenta cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the 15 GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yu40d08.r1 Homo sapiens cDNA clone 23671 5'" (GenBank accession number H62096). The search also found a hit at GenBank accession number H98192. The human cDNA clone corresponding to the EST database entry was ordered from Genome 20 Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AP162".

Applicants' methods identified clone AP162 as encoding a secreted protein.

25 The nucleotide sequence of the 5' portion of AP162 as presently determined is reported in SEQ ID NO:1. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AP162 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:2. Additional nucleotide sequence from the 3' portion of AP162, including the polyA tail, is reported in SEQ ID 30 NO:3.

Protein "AM931"

One protein of the present invention has been identified as protein "AM931". A partial cDNA clone encoding AM931 was first isolated from a human fetal kidney cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yh63e02.r1 Homo sapiens cDNA clone 134426 5'" (GenBank accession number R32076). The search also found a hit at GenBank accession number N30331. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AM931".

Applicants' methods identified clone AM931 as encoding a secreted protein.

The nucleotide sequence of AM931 as presently determined is reported in SEQ ID NO:4. What applicants believe is the proper reading frame and the predicted amino acid sequence of the full length AM931 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:5. Amino acids 1 to 27 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 28.

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Protein "AM610"

One protein of the present invention has been identified as protein "AM610". A partial cDNA clone encoding AM610 was first isolated from a human fetal kidney cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "ym01a10.r1 Human EST 46249 5'" (GenBank accession number H09925). The search also found hits at GenBank accession numbers H09926 and R14298. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone,

including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AM610".

Applicants' methods identified clone AM610 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AM610 as presently determined is 5 reported in SEQ ID NO:6. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AM610 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:7. Amino acids 1 to 23 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 24. Additional nucleotide sequence from the 3' portion of AM610, 10 including the polyA tail, is reported in SEQ ID NO:8.

Protein "AM340"

15 One protein of the present invention has been identified as protein "AM340". A partial cDNA clone encoding AM340 was first isolated from a human fetal kidney cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search 20 revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yo68a05.r1 Homo sapiens cDNA clone 183056 5'" (GenBank accession number H42936). The search also found a hit at GenBank accession number H42872. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The 25 clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AM340".

Applicants' methods identified clone AM340 as encoding a secreted protein.

The nucleotide sequence of AM340 as presently determined is reported in SEQ ID 30 NO:9. What applicants believe is the proper reading frame and the predicted amino acid sequence of the full length AM340 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:10. .

Protein "AM282"

One protein of the present invention has been identified as protein "AM282". A partial cDNA clone encoding AM282 was first isolated from a human fetal kidney cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yf95b10.r1 Human EST 30142 5'" (GenBank accession number R18560).
5 The search also found a thiat GenBank accession number T96696. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as
10 "AM282".
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Applicants' methods identified clone AM282 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AM282 as presently determined is reported in SEQ ID NO:11. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AM282 protein corresponding
20 to the foregoing nucleotide sequence is reported in SEQ ID NO:12. Amino acids 1 to 24 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 25. Additional nucleotide sequence from the 3' portion of AM282, including the polyA tail, is reported in SEQ ID NO:13.

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Protein "AK647"

One protein of the present invention has been identified as protein "AK647". A partial cDNA clone encoding AK647 was first isolated from a human fetal kidney cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "ym40a05.r1 Human EST 50483 5'" (GenBank accession number H17726).
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The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also 5 referred to herein as "AK647".

Applicants' methods identified clone AK647 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AK647 as presently determined is reported in SEQ ID NO:14. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AK647 protein corresponding 10 to the foregoing nucleotide sequence is reported in SEQ ID NO:15. Amino acids 1 to 25 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 26. Additional nucleotide sequence from the 3' portion of AK647, including the polyA tail, is reported in SEQ ID NO:16.

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Protein "AK583"

One protein of the present invention has been identified as protein "AK583". A partial cDNA clone encoding AK583 was first isolated from a human fetal kidney cDNA 20 library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yi90c06.r1 Human EST 14656 5'" (GenBank accession number R77830). 25 The search also found a hit at GenBank accession number H45398. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein 30 as "AK583".

Applicants' methods identified clone AK583 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AK583 as presently determined is reported in SEQ ID NO:17. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AK583 protein corresponding

to the foregoing nucleotide sequence is reported in SEQ ID NO:18. Amino acids 1 to 24 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 25. Additional nucleotide sequence from the 3' portion of AK583, including the polyA tail, is reported in SEQ ID NO:19.

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Protein "AK533"

One protein of the present invention has been identified as protein "AK533". A 10 partial cDNA clone encoding AK533 was first isolated from a human fetal kidney cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium 15 identified as "yb82h07.r1 Homo sapiens cDNA clone 77725 5'" (GenBank accession number T55939). The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full- 20 length clone is also referred to herein as "AK533".

Applicants' methods identified clone AK533 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AK533 as presently determined is reported in SEQ ID NO:20. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AK533 protein corresponding 25 to the foregoing nucleotide sequence is reported in SEQ ID NO:21. Additional nucleotide sequence from the 3' portion of AK533, including the polyA tail, is reported in SEQ ID NO:22.

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Protein "AK296"

One protein of the present invention has been identified as protein "AK296". A partial cDNA clone encoding AK296 was first isolated from a human fetal kidney cDNA library using methods which are selective for cDNAs encoding secreted proteins. The

nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yc86g12.r1 Homo sapeins cDNA clone 22958 5'" (GenBank accession number T75226). The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AK296".

10 Applicants' methods identified clone AK296 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AK296 as presently determined is reported in SEQ ID NO:23. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AK296 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:24. Amino acids 1 to 36
15 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 37. Additional nucleotide sequence from the 3' portion of AK296, including the polyA tail, is reported in SEQ ID NO:25.

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Protein "H617"

One protein of the present invention has been identified as protein "H617". A partial cDNA clone encoding H617 was first isolated from a human PBMC cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "ys11c12.r1 Homo sapeins cDNA clone 214486 5'" (GenBank accession number H71514). The search also found a hit at GenBank accession number R10010. The human cDNA clone
25 corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as
30 "H617".

Applicants' methods identified clone H617 as encoding a secreted protein.

- The nucleotide sequence of the 5' portion of H617 as presently determined is reported in SEQ ID NO:26. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length H617 protein corresponding to 5 the foregoing nucleotide sequence is reported in SEQ ID NO:27. Additional nucleotide sequence from the 3' portion of H617, including the polyA tail, is reported in SEQ ID NO:28.

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Protein "BB9"

- One protein of the present invention has been identified as protein "BB9". A partial cDNA clone encoding BB9 was first isolated from a human PBMC (TH1 or Th2) cDNA library using methods which are selective for cDNAs encoding secreted proteins. The 15 nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yd68g04.r1 Human cDNA clone 113430 5'" (GenBank accession number T78562). The search also found a thi at GenBank accession number R54388. The human 20 cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "BB9".

- 25 Applicants' methods identified clone BB9 as encoding a secreted protein.

- The nucleotide sequence of the 5' portion of BB9 as presently determined is reported in SEQ ID NO:29. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length BB9 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:30. Additional nucleotide 30 sequence from the 3' portion of BB9, including the polyA tail, is reported in SEQ ID NO:31.

Protein "AW191"

One protein of the present invention has been identified as protein "AW191". A partial cDNA clone encoding AW191 was first isolated from a human ovary (PA-1 teratocarcinoma) cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "ym03d10.r1 Homo sapiens cDNA clone 46942 5'" (GenBank accession number H10314. The search also found a hit at GenBank accession number H05460. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AW191".

Applicants' methods identified clone AW191 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AW191 as presently determined is reported in SEQ ID NO:32. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AW191 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:33. Amino acids 1 to 18 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 19. Additional nucleotide sequence from the 3' portion of AW191, including the polyA tail, is reported in SEQ ID NO:34.

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Protein "AT211"

One protein of the present invention has been identified as protein "AT211". A partial cDNA clone encoding AT211 was first isolated from a human lymphocyte and dendritic cell cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yq36f01.r1 Homo sapiens cDNA clone 197881 5'" (GenBank accession number R96278). The search also found a hit at GenBank accession

number R56077. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AT211".

Applicants' methods identified clone AT211 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AT211 as presently determined is reported in SEQ ID NO:35. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AT211 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:36. Amino acids 1 to 53 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 54. Additional nucleotide sequence from the 3' portion of AT211, including the polyA tail, is reported in SEQ ID NO:37.

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Protein "AT205"

One protein of the present invention has been identified as protein "AT205". A partial cDNA clone encoding AT205 was first isolated from a human lymphocyte and dendritic cell cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yu83c11.r1 Homo sapiens cDNA clone 240404 5'" (GenBank accession number H78080). The search also found a hit at GenBank accession number H78081. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AT205".

Applicants' methods identified clone AT205 as encoding a secreted protein.

The nucleotide sequence of AT205 as presently determined is reported in SEQ ID NO:38. What applicants believe is the proper reading frame and the predicted amino acid sequence of the full length AT205 protein corresponding to the foregoing nucleotide

sequence is reported in SEQ ID NO:39. Amino acids 1 to 55 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 56.

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Protein "AS34"

One protein of the present invention has been identified as protein "AS34". A partial cDNA clone encoding AS34 was first isolated from a human fetal brain cDNA library using methods which are selective for cDNAs encoding secreted proteins. The 10 nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yg71a01.r1 Homo sapiens cDNA clone 38531 5'" (GenBank accession number R51118). The search also found a hit at GenBank accession number R15801. The 15 human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AS34".

20 Applicants' methods identified clone AS34 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AS34 as presently determined is reported in SEQ ID NO:40. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AS34 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:41. Amino acids 1 to 24 are 25 the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 25. Additional nucleotide sequence from the 3' portion of AS34, including the polyA tail, is reported in SEQ ID NO:42.

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Protein "AS32"

One protein of the present invention has been identified as protein "AS32". A partial cDNA clone encoding AS32 was first isolated from a human fetal brain cDNA library using methods which are selective for cDNAs encoding secreted proteins. The

nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yu75b08.r1 Homo sapiens cDNA clone 239607 5'" (GenBank accession number H80466). The search also found a hit at GenBank accession number H77627. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AS32".

Applicants' methods identified clone AS32 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AS32 as presently determined is reported in SEQ ID NO:43. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AS32 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:44. Additional nucleotide sequence from the 3' portion of AS32, including the polyA tail, is reported in SEQ ID NO:45.

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Protein "AR260"

One protein of the present invention has been identified as protein "AR260". A partial cDNA clone encoding AR260 was first isolated from a human adult retina cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yg99g12.r1 Homo sapiens cDNA clone 41757 5'" (GenBank accession number R52804). The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AR260".

Applicants' methods identified clone AR260 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AR260 as presently determined is reported in SEQ ID NO:46. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AR260 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:47. Amino acids 1 to 23
5 are the predicted leader/signal sequence, with the predicted mature amino acid sequence beginning at amino acid 24. Additional nucleotide sequence from the 3' portion of AR260, including the polyA tail, is reported in SEQ ID NO:48.

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Protein "K640"

One protein of the present invention has been identified as protein "K640". A partial cDNA clone encoding K640 was first isolated from a murine bone marrow (stromal cell line FCM-4) cDNA library using methods which are selective for cDNAs encoding
15 secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yf47a09.r1 Homo sapiens cDNA clone 129976 5'" (GenBank accession number R11595). The search also found a hit at GenBank accession
20 number H09031. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "K640".

25 Applicants' methods identified clone K640 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of K640 as presently determined is reported in SEQ ID NO:49. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length K640 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:50. Additional nucleotide
30 sequence from the 3' portion of K640, including the polyA tail, is reported in SEQ ID NO:51.

Protein "K39"

One protein of the present invention has been identified as protein "K39". A partial cDNA clone encoding K39 was first isolated from a murine bone marrow (stromal cell line FCM-4) cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "ym65b04.r1 Homo sapiens cDNA clone 163759 5'" (GenBank accession number H14129). The search also found a hit at GenBank accession number H68304. The human cDNA clone corresponding to the EST database entry was ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "K39".

Applicants' methods identified clone K39 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of K39 as presently determined is reported in SEQ ID NO:52. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length K39 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:53. Additional nucleotide sequence from the 3' portion of K39, including the polyA tail, is reported in SEQ ID NO:54.

25 Protein "AT319"

One protein of the present invention has been identified as protein "AT319". A partial cDNA clone encoding AT319 was first isolated from a human lymphocyte and dendritic cell cDNA library using methods which are selective for cDNAs encoding secreted proteins. The nucleotide sequence of such partial cDNA was determined and searched against the GenBank database using BLASTA/BLASTX and FASTA search protocols. The search revealed at least some identity with an EST reported by the I.M.A.G.E. Consortium identified as "yr21b11.r1 Homo sapiens cDNA clone 205917 5'" (GenBank accession number H57730). The search also found a hit at GenBank accession number H57731. The human cDNA clone corresponding to the EST database entry was

ordered from Genome Systems, Inc., St. Louis, Mo, a distributor of the I.M.A.G.E. Consortium library. The clone received from the distributor was examined and determined to be a full length clone, including a 5' end and 3' UTR (including a polyA tail). This full-length clone is also referred to herein as "AT319".

- 5 Applicants' methods identified clone AT319 as encoding a secreted protein.

The nucleotide sequence of the 5' portion of AT319 as presently determined is reported in SEQ ID NO:55. What applicants believe is the proper reading frame and the predicted N-terminal amino acid sequence of the full length AT319 protein corresponding to the foregoing nucleotide sequence is reported in SEQ ID NO:56. Additional nucleotide
10 sequence from the 3' portion of AT319, including the polyA tail, is reported in SEQ ID NO:57.

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Deposit of Clones

Clones AP162, AM931, AM610, AM340, AM282, AK647, AK583, AK533, AK296, H617, BB9, AW191, AT211, AT205, AS34, AS32, AR260, K640, K39 and AT319 were deposited on April 17, 1996 with the American Type Culture Collection under 5 accession number ATCC 98026, from which each clone comprising a particular polynucleotide is obtainable. Each clone has been transfected into separate bacterial cells (*E. coli*) in this composite deposit. Bacterial cells containing a particular clone can be obtained from the composite deposit as follows:

An oligonucleotide probe or probes should be designed to the sequence that is 10 known for that particular clone. This sequence can be derived from the sequences provided herein, or from a combination of those sequences.

The design of the oligonucleotide probe should preferably follow these parameters:

- (a) It should be designed to an area of the sequence which has the fewest ambiguous bases ("N's"), if any;
- 15 (b) It should be designed to have a T_m of approx. 80 ° C (assuming 2° for each A or T and 4 degrees for each G or C).

The oligonucleotide should preferably be labeled with g-³²P ATP (specific activity 6000 Ci/mmole) and T4 polynucleotide kinase using commonly employed techniques for labeling oligonucleotides. Other labeling techniques can also be used. Unincorporated label should 20 preferably be removed by gel filtration chromatography or other established methods. The amount of radioactivity incorporated into the probe should be quantitated by measurement in a scintillation counter. Preferably, specific activity of the resulting probe should be approximately 4e+6 dpm/pmole.

The bacterial culture containing the pool of full-length clones should preferably be 25 thawed and 100 μ l of the stock used to inoculate a sterile culture flask containing 25 ml of sterile L-broth containing ampicillin at 100 μ g/ml. The culture should preferably be grown to saturation at 37°C, and the saturated culture should preferably be diluted in fresh L-broth. Aliquots of these dilutions should preferably be plated to determine the dilution and volume which will yield approximately 5000 distinct and well-separated colonies on solid 30 bacteriological media containing L-broth containing ampicillin at 100 μ g/ml and agar at 1.5% in a 150 mm petri dish when grown overnight at 37°C. Other known methods of obtaining distinct, well-separated colonies can also be employed.

Standard colony hybridization procedures should then be used to transfer the colonies to nitrocellulose filters and lyse, denature and bake them.

The filter is then preferably incubated at 65°C for 1 hour with gentle agitation in 6X SSC (20X stock is 175.3 g NaCl/liter, 88.2 g Na citrate/liter, adjusted to pH 7.0 with NaOH) containing 0.5% SDS, 100 µg/ml of yeast RNA, and 10 mM EDTA (approximately 10 mL per 150 mm filter). Preferably, the probe is then added to the hybridization mix at 5 a concentration greater than or equal to 1e+6 dpm/mL. The filter is then preferably incubated at 65°C with gentle agitation overnight. The filter is then preferably washed in 500 mL of 2X SSC/0.5% SDS at room temperature without agitation, preferably followed by 500 mL of 2X SSC/0.1% SDS at room temperature with gentle shaking for 15 minutes. A third wash with 0.1X SSC/0.5% SDS at 65°C for 30 minutes to 1 hour is optional. The 10 filter is then preferably dried and subjected to autoradiography for sufficient time to visualize the positives on the X-ray film. Other known hybridization methods can also be employed.

The positive colonies are picked, grown in culture, and plasmid DNA isolated using standard procedures. The clones can then be verified by restriction analysis, hybridization 15 analysis, or DNA sequencing.

Fragments of the proteins of the present invention which are capable of exhibiting biological activity are also encompassed by the present invention. Fragments of the protein 20 may be in linear form or they may be cyclized using known methods, for example, as described in H.U. Saragovi, *et al.*, Bio/Technology 10, 773-778 (1992) and in R.S. McDowell, *et al.*, J. Amer. Chem. Soc. 114, 9245-9253 (1992), both of which are incorporated herein by reference. Such fragments may be fused to carrier molecules such as immunoglobulins for many purposes, including increasing the valency of protein binding 25 sites. For example, fragments of the protein may be fused through "linker" sequences to the Fc portion of an immunoglobulin. For a bivalent form of the protein, such a fusion could be to the Fc portion of an IgG molecule. Other immunoglobulin isotypes may also be used to generate such fusions. For example, a protein - IgM fusion would generate a decavalent form of the protein of the invention.

30 The present invention also provides both full-length and mature forms of the disclosed proteins. The full-length form of the such proteins is identified in the sequence listing by translation of the nucleotide sequence of each disclosed clone. The mature form of such protein may be obtained by expression of the disclosed full-length polynucleotide (preferably those deposited with ATCC) in a suitable mammalian cell or other host cell.

The sequence of the mature form of the protein may also be determinable from the amino acid sequence of the full-length form.

Where the protein of the present invention is membrane-bound (e.g., is a receptor), the present invention also provides for soluble forms of such protein. In such forms part 5 or all of the intracellular and transmembrane domains of the protein are deleted such that the protein is fully secreted from the cell in which it is expressed. The intracellular and transmembrane domains of proteins of the invention can be identified in accordance with known techniques for determination of such domains from sequence information.

Species homologs of the disclosed proteins are also provided by the present 10 invention. Species homologs may be isolated and identified by making suitable probes or primers from the sequences provided herein and screening a suitable nucleic acid source from the desired species.

The invention also encompasses allelic variants of the disclosed proteins: that is, naturally-occurring alternative forms of the isolated proteins which are identical, 15 homologous or related to that encoded by the polynucleotides disclosed herein.

The isolated polynucleotide encoding the protein of the invention may be operably linked to an expression control sequence such as the pMT2 or pED expression vectors disclosed in Kaufman *et al.*, Nucleic Acids Res. 19, 4485-4490 (1991), in order to produce the protein recombinantly. Many suitable expression control sequences are known in the 20 art. General methods of expressing recombinant proteins are also known and are exemplified in R. Kaufman, Methods in Enzymology 185, 537-566 (1990). As defined herein "operably linked" means that the isolated polynucleotide of the invention and an expression control sequence are situated within a vector or cell in such a way that the protein is expressed by a host cell which has been transformed (transfected) with the ligated 25 polynucleotide/expression control sequence.

A number of types of cells may act as suitable host cells for expression of the protein. Mammalian host cells include, for example, monkey COS cells, Chinese Hamster Ovary (CHO) cells, human kidney 293 cells, human epidermal A431 cells, human Colo205 cells, 3T3 cells, CV-1 cells, other transformed primate cell lines, normal diploid cells, cell 30 strains derived from *in vitro* culture of primary tissue, primary explants, HeLa cells, mouse L cells, BHK, HL-60, U937, HaK or Jurkat cells.

Alternatively, it may be possible to produce the protein in lower eukaryotes such as yeast or in prokaryotes such as bacteria. Potentially suitable yeast strains include *Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*, *Kluyveromyces* strains, *Candida*,

or any yeast strain capable of expressing heterologous proteins. Potentially suitable bacterial strains include *Escherichia coli*, *Bacillus subtilis*, *Salmonella typhimurium*, or any bacterial strain capable of expressing heterologous proteins. If the protein is made in yeast or bacteria, it may be necessary to modify the protein produced therein, for example by 5 phosphorylation or glycosylation of the appropriate sites, in order to obtain the functional protein. Such covalent attachments may be accomplished using known chemical or enzymatic methods.

The protein may also be produced by operably linking the isolated polynucleotide of the invention to suitable control sequences in one or more insect expression vectors, and 10 employing an insect expression system. Materials and methods for baculovirus/insect cell expression systems are commercially available in kit form from, e.g., Invitrogen, San Diego, California, U.S.A. (the MaxBac® kit), and such methods are well known in the art, as described in Summers and Smith, Texas Agricultural Experiment Station Bulletin No. 1555 (1987), incorporated herein by reference. As used herein, an insect cell capable of 15 expressing a polynucleotide of the present invention is "transformed."

The protein of the invention may be prepared by culturing transformed host cells under culture conditions suitable to express the recombinant protein. The resulting expressed protein may then be purified from such culture (i.e., from culture medium or cell extracts) using known purification processes, such as gel filtration and ion exchange 20 chromatography. The purification of the protein may also include an affinity column containing agents which will bind to the protein; one or more column steps over such affinity resins as concanavalin A-agarose, heparin-toyopearl® or Cibacrom blue 3GA Sepharose®; one or more steps involving hydrophobic interaction chromatography using such resins as phenyl ether, butyl ether, or propyl ether; or immunoaffinity 25 chromatography.

Alternatively, the protein of the invention may also be expressed in a form which will facilitate purification. For example, it may be expressed as a fusion protein, such as those of maltose binding protein (MBP), glutathione-S-transferase (GST) or thioredoxin (TRX). Kits for expression and purification of such fusion proteins are commercially 30 available from New England BioLab (Beverly, MA), Pharmacia (Piscataway, NJ) and InVitrogen, respectively. The protein can also be tagged with an epitope and subsequently purified by using a specific antibody directed to such epitope. One such epitope ("Flag") is commercially available from Kodak (New Haven, CT).

Finally, one or more reverse-phase high performance liquid chromatography (RP-HPLC) steps employing hydrophobic RP-HPLC media, e.g., silica gel having pendant methyl or other aliphatic groups, can be employed to further purify the protein. Some or all of the foregoing purification steps, in various combinations, can also be employed to 5 provide a substantially homogeneous isolated recombinant protein. The protein thus purified is substantially free of other mammalian proteins and is defined in accordance with the present invention as an "isolated protein."

The protein of the invention may also be expressed as a product of transgenic animals, e.g., as a component of the milk of transgenic cows, goats, pigs, or sheep which 10 are characterized by somatic or germ cells containing a nucleotide sequence encoding the protein.

The protein may also be produced by known conventional chemical synthesis. Methods for constructing the proteins of the present invention by synthetic means are known to those skilled in the art. The synthetically-constructed protein sequences, by virtue 15 of sharing primary, secondary or tertiary structural and/or conformational characteristics with proteins may possess biological properties in common therewith, including protein activity. Thus, they may be employed as biologically active or immunological substitutes for natural, purified proteins in screening of therapeutic compounds and in immunological processes for the development of antibodies.

20 The proteins provided herein also include proteins characterized by amino acid sequences similar to those of purified proteins but into which modification are naturally provided or deliberately engineered. For example, modifications in the peptide or DNA sequences can be made by those skilled in the art using known techniques. Modifications of interest in the protein sequences may include the alteration, substitution, replacement, 25 insertion or deletion of a selected amino acid residue in the coding sequence. For example, one or more of the cysteine residues may be deleted or replaced with another amino acid to alter the conformation of the molecule. Techniques for such alteration, substitution, replacement, insertion or deletion are well known to those skilled in the art (see, e.g., U.S. Patent No. 4,518,584). Preferably, such alteration, substitution, replacement, insertion or 30 deletion retains the desired activity of the protein.

Other fragments and derivatives of the sequences of proteins which would be expected to retain protein activity in whole or in part and may thus be useful for screening or other immunological methodologies may also be easily made by those skilled in the art

given the disclosures herein. Such modifications are believed to be encompassed by the present invention.

USES AND BIOLOGICAL ACTIVITY

- 5 The proteins of the present invention are expected to exhibit one or more of the uses or biological activities (including those associated with assays cited herein) identified below. Uses or activities described for proteins of the present invention may be provided by administration or use of such proteins or by administration or use of polynucleotides encoding such proteins (such as, for example, in gene therapies or vectors suitable for
10 introduction of DNA).

Research Uses and Utilities

- The proteins provided by the present invention can similarly be used in assay to determine biological activity, including in a panel of multiple proteins for high-throughput screening; to raise antibodies or to elicit another immune response; as a reagent (including the labeled reagent) in assays designed to quantitatively determine levels of the protein (or its receptor) in biological fluids; as markers for tissues in which the corresponding protein is preferentially expressed (either constitutively or at a particular stage of tissue differentiation or development or in a disease state); and, of course, to isolate correlative receptors or ligands. Where the protein binds or potentially binds to another protein (such as, for example, in a receptor-ligand interaction), the protein can be used to identify the other protein with which binding occurs or to identify inhibitors of the binding interaction. Proteins involved in these binding interactions can also be used to screen for peptide or small molecule inhibitors or agonists of the binding interaction.
15
20
25 Any or all of these research utilities are capable of being developed into reagent grade or kit format for commercialization as research products.

- Methods for performing the uses listed above are well known to those skilled in the art. References disclosing such methods include without limitation "Molecular Cloning: A Laboratory Manual", 2d ed., Cold Spring Harbor Laboratory Press, Sambrook, J., E.F. Fritsch and T. Maniatis eds., 1989, and "Methods in Enzymology: Guide to Molecular Cloning Techniques", Academic Press, Berger, S.L. and A.R. Kimmel eds., 1987.

Nutritional Uses

Proteins of the present invention can also be used as nutritional sources or supplements. Such uses include without limitation use as a protein or amino acid supplement, use as a carbon source, use as a nitrogen source and use as a source of carbohydrate. In such cases the protein of the invention can be added to the feed of a particular organism or can be administered as a separate solid or liquid preparation, such as in the form of powder, pills, solutions, suspensions or capsules. In the case of microorganisms, the protein of the invention can be added to the medium in or on which the microorganism is cultured.

10 Cytokine and Cell Proliferation/Differentiation Activity

A protein of the present invention may exhibit cytokine, cell proliferation (either inducing or inhibiting) or cell differentiation (either inducing or inhibiting) activity or may induce production of other cytokines in certain cell populations. Many protein factors discovered to date, including all known cytokines, have exhibited activity in one or more factor dependent cell proliferation assays, and hence the assays serve as a convenient confirmation of cytokine activity. The activity of a protein of the present invention is evidenced by any one of a number of routine factor dependent cell proliferation assays for cell lines including, without limitation, 32D, DA2, DA1G, T10, B9, B9/11, BaF3, MC9/G, M+ (preB M+), 2E8, RB5, DA1, 123, T1165, HT2, CTLL2, TF-1, Mo7e and CMK.

20 The activity of a protein of the invention may, among other means, be measured by the following methods:

Assays for T-cell or thymocyte proliferation include without limitation those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Takai et al., J. Immunol. 137:3494-3500, 1986; Bertagnolli et al., J. Immunol. 145:1706-1712, 1990; Bertagnolli et al., Cellular Immunology 133:327-341, 1991; Bertagnolli, et al., J. Immunol. 149:3778-3783, 1992; Bowman et al., J. Immunol. 152: 1756-1761, 1994.

30 Assays for cytokine production and/or proliferation of spleen cells, lymph node cells or thymocytes include, without limitation, those described in: Polyclonal T cell stimulation, Kruisbeek, A.M. and Shevach, E.M. In *Current Protocols in Immunology*. J.E.e.a. Coligan eds. Vol 1 pp. 3.12.1-3.12.14, John Wiley and Sons, Toronto. 1994; and Measurement of mouse and human Interferon γ , Schreiber, R.D. In *Current Protocols in*

Immunology. J.E.e.a. Coligan eds. Vol 1 pp. 6.8.1-6.8.8, John Wiley and Sons, Toronto. 1994.

Assays for proliferation and differentiation of hematopoietic and lymphopoietic cells include, without limitation, those described in: Measurement of Human and Murine

- 5 Interleukin 2 and Interleukin 4, Bottomly, K., Davis, L.S. and Lipsky, P.E. In *Current Protocols in Immunology.* J.E.e.a. Coligan eds. Vol 1 pp. 6.3.1-6.3.12, John Wiley and Sons, Toronto. 1991; DeVries et al., *J. Exp. Med.* 173:1205-1211, 1991; Moreau et al., *Nature* 336:690-692, 1988; Greenberger et al., *Proc. Natl. Acad. Sci. U.S.A.* 80:2931-2938, 1983; Measurement of mouse and human interleukin 6 - Nordan, R. In
10 *Current Protocols in Immunology.* J.E.e.a. Coligan eds. Vol 1 pp. 6.6.1-6.6.5, John Wiley and Sons, Toronto. 1991; Smith et al., *Proc. Natl. Acad. Sci. U.S.A.* 83:1857-1861, 1986; Measurement of human Interleukin 11 - Bennett, F., Giannotti, J., Clark, S.C. and Turner, K.J. In *Current Protocols in Immunology.* J.E.e.a. Coligan eds. Vol 1 pp. 6.15.1 John Wiley and Sons, Toronto. 1991; Measurement of mouse and human Interleukin 9 -
15 Ciarletta, A., Giannotti, J., Clark, S.C. and Turner, K.J. In *Current Protocols in Immunology.* J.E.e.a. Coligan eds. Vol 1 pp. 6.13.1, John Wiley and Sons, Toronto. 1991.

Assays for T-cell clone responses to antigens (which will identify, among others, proteins that affect APC-T cell interactions as well as direct T-cell effects by measuring proliferation and cytokine production) include, without limitation, those described in:

- 20 Current Protocols in Immunology, Ed by J. E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, *In Vitro assays for Mouse Lymphocyte Function*; Chapter 6, *Cytokines and their cellular receptors*; Chapter 7, *Immunologic studies in Humans*); Weinberger et al., *Proc. Natl. Acad. Sci. USA* 77:6091-6095, 1980; Weinberger et al., *Eur. J. Immun.*
25 11:405-411, 1981; Takai et al., *J. Immunol.* 137:3494-3500, 1986; Takai et al., *J. Immunol.* 140:508-512, 1988.

Immune Stimulating or Suppressing Activity

- A protein of the present invention may also exhibit immune stimulating or immune
30 suppressing activity, including without limitation the activities for which assays are described herein. A protein may be useful in the treatment of various immune deficiencies and disorders (including severe combined immunodeficiency (SCID)), e.g., in regulating (up or down) growth and proliferation of T and/or B lymphocytes, as well as effecting the cytolytic activity of NK cells and other cell populations. These immune deficiencies may

be genetic or be caused by viral (e.g., HIV) as well as bacterial or fungal infections, or may result from autoimmune disorders. More specifically, infectious diseases causes by viral, bacterial, fungal or other infection may be treatable using a protein of the present invention, including infections by HIV, hepatitis viruses, herpesviruses, mycobacteria, 5 Leishmania spp., malaria spp. and various fungal infections such as candidiasis. Of course, in this regard, a protein of the present invention may also be useful where a boost to the immune system generally may be desirable, *i.e.*, in the treatment of cancer.

Autoimmune disorders which may be treated using a protein of the present invention include, for example, connective tissue disease, multiple sclerosis, systemic lupus 10 erythematosus, rheumatoid arthritis, autoimmune pulmonary inflammation, Guillain-Barre syndrome, autoimmune thyroiditis, insulin dependent diabetes mellitus, myasthenia gravis, graft-versus-host disease and autoimmune inflammatory eye disease. Such a protein of the present invention may also be useful in the treatment of allergic reactions and conditions, such as asthma (particularly allergic asthma) or other respiratory problems. Other 15 conditions, in which immune suppression is desired (including, for example, organ transplantation), may also be treatable using a protein of the present invention.

Using the proteins of the invention it may also be possible to immune responses, in a number of ways. Down regulation may be in the form of inhibiting or blocking an immune response already in progress or may involve preventing the induction of an immune 20 response. The functions of activated T cells may be inhibited by suppressing T cell responses or by inducing specific tolerance in T cells, or both. Immunosuppression of T cell responses is generally an active, non-antigen-specific, process which requires continuous exposure of the T cells to the suppressive agent. Tolerance, which involves inducing non-responsiveness or anergy in T cells, is distinguishable from 25 immunosuppression in that it is generally antigen-specific and persists after exposure to the tolerizing agent has ceased. Operationally, tolerance can be demonstrated by the lack of a T cell response upon reexposure to specific antigen in the absence of the tolerizing agent.

Down regulating or preventing one or more antigen functions (including without limitation B lymphocyte antigen functions (such as, for example, B7)), *e.g.*, preventing 30 high level lymphokine synthesis by activated T cells, will be useful in situations of tissue, skin and organ transplantation and in graft-versus-host disease (GVHD). For example, blockage of T cell function should result in reduced tissue destruction in tissue transplantation. Typically, in tissue transplants, rejection of the transplant is initiated through its recognition as foreign by T cells, followed by an immune reaction that destroys

the transplant. The administration of a molecule which inhibits or blocks interaction of a B7 lymphocyte antigen with its natural ligand(s) on immune cells (such as a soluble, monomeric form of a peptide having B7-2 activity alone or in conjunction with a monomeric form of a peptide having an activity of another B lymphocyte antigen (*e.g.*, B7-5, B7-1, B7-3) or blocking antibody), prior to transplantation can lead to the binding of the molecule to the natural ligand(s) on the immune cells without transmitting the corresponding costimulatory signal. Blocking B lymphocyte antigen function in this manner prevents cytokine synthesis by immune cells, such as T cells, and thus acts as an immunosuppressant. Moreover, the lack of costimulation may also be sufficient to anergize the T cells, thereby 10 inducing tolerance in a subject. Induction of long-term tolerance by B lymphocyte antigen-blocking reagents may avoid the necessity of repeated administration of these blocking reagents. To achieve sufficient immunosuppression or tolerance in a subject, it may also be necessary to block the function of a combination of B lymphocyte antigens.

The efficacy of particular blocking reagents in preventing organ transplant rejection 15 or GVHD can be assessed using animal models that are predictive of efficacy in humans. Examples of appropriate systems which can be used include allogeneic cardiac grafts in rats and xenogeneic pancreatic islet cell grafts in mice, both of which have been used to examine the immunosuppressive effects of CTLA4Ig fusion proteins *in vivo* as described in Lenschow *et al.*, Science 257:789-792 (1992) and Turka *et al.*, Proc. Natl. Acad. Sci. 20 USA, 89:11102-11105 (1992). In addition, murine models of GVHD (see Paul ed., Fundamental Immunology, Raven Press, New York, 1989, pp. 846-847) can be used to determine the effect of blocking B lymphocyte antigen function *in vivo* on the development of that disease.

Blocking antigen function may also be therapeutically useful for treating 25 autoimmune diseases. Many autoimmune disorders are the result of inappropriate activation of T cells that are reactive against self tissue and which promote the production of cytokines and autoantibodies involved in the pathology of the diseases. Preventing the activation of autoreactive T cells may reduce or eliminate disease symptoms. Administration of reagents which block costimulation of T cells by disrupting receptor:ligand interactions of B 30 lymphocyte antigens can be used to inhibit T cell activation and prevent production of autoantibodies or T cell-derived cytokines which may be involved in the disease process. Additionally, blocking reagents may induce antigen-specific tolerance of autoreactive T cells which could lead to long-term relief from the disease. The efficacy of blocking reagents in preventing or alleviating autoimmune disorders can be determined using a number of

well-characterized animal models of human autoimmune diseases. Examples include murine experimental autoimmune encephalitis, systemic lupus erythematosus in MRL/lpr/lpr mice or NZB hybrid mice, murine autoimmune collagen arthritis, diabetes mellitus in NOD mice and BB rats, and murine experimental myasthenia gravis (see Paul ed., *Fundamental Immunology*, Raven Press, New York, 1989, pp. 840-856).

- Upregulation of an antigen function (preferably a B lymphocyte antigen function), as a means of up regulating immune responses, may also be useful in therapy. Upregulation of immune responses may be in the form of enhancing an existing immune response or eliciting an initial immune response. For example, enhancing an immune response through stimulating B lymphocyte antigen function may be useful in cases of viral infection. In addition, systemic viral diseases such as influenza, the common cold, and encephalitis might be alleviated by the administration of stimulatory forms of B lymphocyte antigens systemically.

- Alternatively, anti-viral immune responses may be enhanced in an infected patient by removing T cells from the patient, costimulating the T cells *in vitro* with viral antigen-pulsed APCs either expressing a peptide of the present invention or together with a stimulatory form of a soluble peptide of the present invention and reintroducing the *in vitro* activated T cells into the patient. Another method of enhancing anti-viral immune responses would be to isolate infected cells from a patient, transfet them with a nucleic acid encoding a protein of the present invention as described herein such that the cells express all or a portion of the protein on their surface, and reintroduce the transfected cells into the patient. The infected cells would now be capable of delivering a costimulatory signal to, and thereby activate, T cells *in vivo*.

- In another application, up regulation or enhancement of antigen function (preferably B lymphocyte antigen function) may be useful in the induction of tumor immunity. Tumor cells (*e.g.*, sarcoma, melanoma, lymphoma, leukemia, neuroblastoma, carcinoma) transfected with a nucleic acid encoding at least one peptide of the present invention can be administered to a subject to overcome tumor-specific tolerance in the subject. If desired, the tumor cell can be transfected to express a combination of peptides. For example, tumor cells obtained from a patient can be transfected *ex vivo* with an expression vector directing the expression of a peptide having B7-2-like activity alone, or in conjunction with a peptide having B7-1-like activity and/or B7-3-like activity. The transfected tumor cells are returned to the patient to result in expression of the peptides on the surface of the

transfected cell. Alternatively, gene therapy techniques can be used to target a tumor cell for transfection *in vivo*.

The presence of the peptide of the present invention having the activity of a B lymphocyte antigen(s) on the surface of the tumor cell provides the necessary costimulation signal to T cells to induce a T cell mediated immune response against the transfected tumor cells. In addition, tumor cells which lack MHC class I or MHC class II molecules, or which fail to reexpress sufficient amounts of MHC class I or MHC class II molecules, can be transfected with nucleic acid encoding all or a portion of (*e.g.*, a cytoplasmic-domain truncated portion) of an MHC class I α chain protein and β_2 microglobulin protein or an MHC class II α chain protein and an MHC class II β chain protein to thereby express MHC class I or MHC class II proteins on the cell surface. Expression of the appropriate class I or class II MHC in conjunction with a peptide having the activity of a B lymphocyte antigen (*e.g.*, B7-1, B7-2, B7-3) induces a T cell mediated immune response against the transfected tumor cell. Optionally, a gene encoding an antisense construct which blocks expression of an MHC class II associated protein, such as the invariant chain, can also be cotransfected with a DNA encoding a peptide having the activity of a B lymphocyte antigen to promote presentation of tumor associated antigens and induce tumor specific immunity. Thus, the induction of a T cell mediated immune response in a human subject may be sufficient to overcome tumor-specific tolerance in the subject.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Suitable assays for thymocyte or splenocyte cytotoxicity include, without limitation, those described in: Current Protocols in Immunology, Ed by J. E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, In Vitro assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Herrmann et al., Proc. Natl. Acad. Sci. USA 78:2488-2492, 1981; Herrmann et al., J. Immunol. 128:1968-1974, 1982; Handa et al., J. Immunol. 135:1564-1572, 1985; Takai et al., J. Immunol. 137:3494-3500, 1986; Takai et al., J. Immunol. 140:508-512, 1988; Herrmann et al., Proc. Natl. Acad. Sci. USA 78:2488-2492, 1981; Herrmann et al., J. Immunol. 128:1968-1974, 1982; Handa et al., J. Immunol. 135:1564-1572, 1985; Takai et al., J. Immunol. 137:3494-3500, 1986; Bowman et al., J. Virology 61:1992-1998; Takai et al., J. Immunol. 140:508-512, 1988; Bertagnolli et al., Cellular Immunology 133:327-341, 1991; Brown et al., J. Immunol. 153:3079-3092, 1994.

Assays for T-cell-dependent immunoglobulin responses and isotype switching (which will identify, among others, proteins that modulate T-cell dependent antibody responses and that affect Th1/Th2 profiles) include, without limitation, those described in: Maliszewski, J.: *Immunol.* 144:3028-3033, 1990; and Assays for B cell function: *In vitro* antibody production, Mond, J.J. and Brunswick, M. In *Current Protocols in Immunology*. J.E.e.a. Coligan eds. Vol 1 pp. 3.8.1-3.8.16, John Wiley and Sons, Toronto. 1994.

Mixed lymphocyte reaction (MLR) assays (which will identify, among others, proteins that generate predominantly Th1 and CTL responses) include, without limitation, those described in: *Current Protocols in Immunology*, Ed by J. E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 3, *In Vitro* assays for Mouse Lymphocyte Function 3.1-3.19; Chapter 7, Immunologic studies in Humans); Takai et al., *J. Immunol.* 137:3494-3500, 1986; Takai et al., *J. Immunol.* 140:508-512, 1988; Bertagnolli et al., *J. Immunol.* 149:3778-3783, 1992.

Dendritic cell-dependent assays (which will identify, among others, proteins expressed by dendritic cells that activate naive T-cells) include, without limitation, those described in: Guery et al., *J. Immunol.* 134:536-544, 1995; Inaba et al., *Journal of Experimental Medicine* 173:549-559, 1991; Macatonia et al., *Journal of Immunology* 154:5071-5079, 1995; Porgador et al., *Journal of Experimental Medicine* 182:255-260, 1995; Nair et al., *Journal of Virology* 67:4062-4069, 1993; Huang et al., *Science* 264:961-965, 1994; Macatonia et al., *Journal of Experimental Medicine* 169:1255-1264, 1989; Bhardwaj et al., *Journal of Clinical Investigation* 94:797-807, 1994; and Inaba et al., *Journal of Experimental Medicine* 172:631-640, 1990.

Assays for lymphocyte survival/apoptosis (which will identify, among others, proteins that prevent apoptosis after superantigen induction and proteins that regulate lymphocyte homeostasis) include, without limitation, those described in: Darzynkiewicz et al., *Cytometry* 13:795-808, 1992; Gorczyca et al., *Leukemia* 7:659-670, 1993; Gorczyca et al., *Cancer Research* 53:1945-1951, 1993; Itoh et al., *Cell* 66:233-243, 1991; Zacharchuk, *Journal of Immunology* 145:4037-4045, 1990; Zamai et al., *Cytometry* 14:891-897, 1993; Gorczyca et al., *International Journal of Oncology* 1:639-648, 1992.

Assays for proteins that influence early steps of T-cell commitment and development include, without limitation, those described in: Antica et al., *Blood* 84:111-117, 1994; Fine et al., *Cellular Immunology* 155:111-122, 1994; Galy et al., *Blood* 85:2770-2778, 1995; Toki et al., *Proc. Nat. Acad Sci. USA* 88:7548-7551, 1991.

Hematopoiesis Regulating Activity

A protein of the present invention may be useful in regulation of hematopoiesis and, consequently, in the treatment of myeloid or lymphoid cell deficiencies. Even marginal biological activity in support of colony forming cells or of factor-dependent cell lines 5 indicates involvement in regulating hematopoiesis, e.g. in supporting the growth and proliferation of erythroid progenitor cells alone or in combination with other cytokines, thereby indicating utility, for example, in treating various anemias or for use in conjunction with irradiation/chemotherapy to stimulate the production of erythroid precursors and/or erythroid cells; in supporting the growth and proliferation of myeloid cells such as 10 granulocytes and monocytes/macrophages (i.e., traditional CSF activity) useful, for example, in conjunction with chemotherapy to prevent or treat consequent myelo-suppression; in supporting the growth and proliferation of megakaryocytes and consequently of platelets thereby allowing prevention or treatment of various platelet disorders such as thrombocytopenia, and generally for use in place of or complimentary to platelet 15 transfusions; and/or in supporting the growth and proliferation of hematopoietic stem cells which are capable of maturing to any and all of the above-mentioned hematopoietic cells and therefore find therapeutic utility in various stem cell disorders (such as those usually treated with transplantation, including, without limitation, aplastic anemia and paroxysmal nocturnal hemoglobinuria), as well as in repopulating the stem cell compartment post 20 irradiation/chemotherapy, either *in-vivo* or *ex-vivo* (i.e., in conjunction with bone marrow transplantation or with peripheral progenitor cell transplantation (homologous or heterologous)) as normal cells or genetically manipulated for gene therapy.

The activity of a protein of the invention may, among other means, be measured by the following methods:

25 Suitable assays for proliferation and differentiation of various hematopoietic lines are cited above.

Assays for embryonic stem cell differentiation (which will identify, among others, proteins that influence embryonic differentiation hematopoiesis) include, without limitation, those described in: Johansson et al. *Cellular Biology* 15:141-151, 1995; Keller et al., 30 *Molecular and Cellular Biology* 13:473-486, 1993; McClanahan et al., *Blood* 81:2903-2915, 1993.

Assays for stem cell survival and differentiation (which will identify, among others, proteins that regulate lympho-hematopoiesis) include, without limitation, those described in: Methylcellulose colony forming assays, Freshney, M.G. In *Culture of Hematopoietic*

Cells. R.I. Freshney, *et al.* eds. Vol pp. 265-268, Wiley-Liss, Inc., New York, NY. 1994; Hirayama et al., Proc. Natl. Acad. Sci. USA 89:5907-5911, 1992; Primitive hematopoietic colony forming cells with high proliferative potential, McNiece, I.K. and Briddell, R.A. In *Culture of Hematopoietic Cells.* R.I. Freshney, *et al.* eds. Vol pp. 23-39, Wiley-Liss, Inc., New York, NY. 1994; Neben et al., Experimental Hematology 22:353-359, 1994; Cobblestone area forming cell assay, Ploemacher, R.E. In *Culture of Hematopoietic Cells.* R.I. Freshney, *et al.* eds. Vol pp. 1-21, Wiley-Liss, Inc., New York, NY. 1994; Long term bone marrow cultures in the presence of stromal cells, Spooncer, E., Dexter, M. and Allen, T. In *Culture of Hematopoietic Cells.* R.I. Freshney, *et al.* eds. Vol pp. 163-179, Wiley-Liss, Inc., New York, NY. 1994; Long term culture initiating cell assay, Sutherland, H.J. In *Culture of Hematopoietic Cells.* R.I. Freshney, *et al.* eds. Vol pp. 139-162, Wiley-Liss, Inc., New York, NY. 1994.

Tissue Growth Activity

15 A protein of the present invention also may have utility in compositions used for bone, cartilage, tendon, ligament and/or nerve tissue growth or regeneration, as well as for wound healing and tissue repair and replacement, and in the treatment of burns, incisions and ulcers.

20 A protein of the present invention, which induces cartilage and/or bone growth in circumstances where bone is not normally formed, has application in the healing of bone fractures and cartilage damage or defects in humans and other animals. Such a preparation employing a protein of the invention may have prophylactic use in closed as well as open fracture reduction and also in the improved fixation of artificial joints. *De novo* bone formation induced by an osteogenic agent contributes to the repair of congenital, trauma 25 induced, or oncologic resection induced craniofacial defects, and also is useful in cosmetic plastic surgery.

30 A protein of this invention may also be used in the treatment of periodontal disease, and in other tooth repair processes. Such agents may provide an environment to attract bone-forming cells, stimulate growth of bone-forming cells or induce differentiation of progenitors of bone-forming cells. A protein of the invention may also be useful in the treatment of osteoporosis or osteoarthritis, such as through stimulation of bone and/or cartilage repair or by blocking inflammation or processes of tissue destruction (collagenase activity, osteoclast activity, etc.) mediated by inflammatory processes.

- Another category of tissue regeneration activity that may be attributable to the protein of the present invention is tendon/ligament formation. A protein of the present invention, which induces tendon/ligament-like tissue or other tissue formation in circumstances where such tissue is not normally formed, has application in the healing of
- 5 tendon or ligament tears, deformities and other tendon or ligament defects in humans and other animals. Such a preparation employing a tendon/ligament-like tissue inducing protein may have prophylactic use in preventing damage to tendon or ligament tissue, as well as use in the improved fixation of tendon or ligament to bone or other tissues, and in repairing defects to tendon or ligament tissue. De novo tendon/ligament-like tissue formation induced
- 10 by a composition of the present invention contributes to the repair of congenital, trauma induced, or other tendon or ligament defects of other origin, and is also useful in cosmetic plastic surgery for attachment or repair of tendons or ligaments. The compositions of the present invention may provide an environment to attract tendon- or ligament-forming cells, stimulate growth of tendon- or ligament-forming cells, induce differentiation of progenitors
- 15 of tendon- or ligament-forming cells, or induce growth of tendon/ligament cells or progenitors *ex vivo* for return *in vivo* to effect tissue repair. The compositions of the invention may also be useful in the treatment of tendinitis, carpal tunnel syndrome and other tendon or ligament defects. The compositions may also include an appropriate matrix and/or sequestering agent as a carrier as is well known in the art.
- 20 The protein of the present invention may also be useful for proliferation of neural cells and for regeneration of nerve and brain tissue, *i.e.* for the treatment of central and peripheral nervous system diseases and neuropathies, as well as mechanical and traumatic disorders, which involve degeneration, death or trauma to neural cells or nerve tissue. More specifically, a protein may be used in the treatment of diseases of the peripheral
- 25 nervous system, such as peripheral nerve injuries, peripheral neuropathy and localized neuropathies, and central nervous system diseases, such as Alzheimer's, Parkinson's disease, Huntington's disease, amyotrophic lateral sclerosis, and Shy-Drager syndrome. Further conditions which may be treated in accordance with the present invention include mechanical and traumatic disorders, such as spinal cord disorders, head trauma and
- 30 cerebrovascular diseases such as stroke. Peripheral neuropathies resulting from chemotherapy or other medical therapies may also be treatable using a protein of the invention.

Proteins of the invention may also be useful to promote better or faster closure of non-healing wounds, including without limitation pressure ulcers, ulcers associated with vascular insufficiency, surgical and traumatic wounds, and the like.

It is expected that a protein of the present invention may also exhibit activity for 5 generation or regeneration of other tissues, such as organs (including, for example, pancreas, liver, intestine, kidney, skin, endothelium), muscle (smooth, skeletal or cardiac) and vascular (including vascular endothelium) tissue, or for promoting the growth of cells comprising such tissues. Part of the desired effects may be by inhibition or modulation of fibrotic scarring to allow normal tissue to regenerate. A protein of the invention may also 10 exhibit angiogenic activity.

A protein of the present invention may also be useful for gut protection or regeneration and treatment of lung or liver fibrosis, reperfusion injury in various tissues, and conditions resulting from systemic cytokine damage.

A protein of the present invention may also be useful for promoting or inhibiting 15 differentiation of tissues described above from precursor tissues or cells; or for inhibiting the growth of tissues described above.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Assays for tissue generation activity include, without limitation, those described in: 20 International Patent Publication No. WO95/16035 (bone, cartilage, tendon); International Patent Publication No. WO95/05846 (nerve, neuronal); International Patent Publication No. WO91/07491 (skin, endothelium).

Assays for wound healing activity include, without limitation, those described in: Winter, Epidermal Wound Healing, pps. 71-112 (Maibach, HI and Rovee, DT, eds.), Year 25 Book Medical Publishers, Inc., Chicago, as modified by Eaglstein and Mertz, J. Invest. Dermatol 71:382-84 (1978).

Activin/Inhibin Activity

A protein of the present invention may also exhibit activin- or inhibin-related 30 activities. Inhibins are characterized by their ability to inhibit the release of follicle stimulating hormone (FSH), while activins are characterized by their ability to stimulate the release of follicle stimulating hormone (FSH). Thus, a protein of the present invention, alone or in heterodimers with a member of the inhibin α family, may be useful as a contraceptive based on the ability of inhibins to decrease fertility in female mammals and

decrease spermatogenesis in male mammals. Administration of sufficient amounts of other inhibins can induce infertility in these mammals. Alternatively, the protein of the invention, as a homodimer or as a heterodimer with other protein subunits of the inhibin- β group, may be useful as a fertility inducing therapeutic, based upon the ability of activin molecules in stimulating FSH release from cells of the anterior pituitary. See, for example, United States Patent 4,798,885. A protein of the invention may also be useful for advancement of the onset of fertility in sexually immature mammals, so as to increase the lifetime reproductive performance of domestic animals such as cows, sheep and pigs.

The activity of a protein of the invention may, among other means, be measured
10 by the following methods:

Assays for activin/inhibin activity include, without limitation, those described in:
Vale et al., Endocrinology 91:562-572, 1972; Ling et al., Nature 321:779-782, 1986; Vale et al., Nature 321:776-779, 1986; Mason et al., Nature 318:659-663, 1985; Forage et al., Proc. Natl. Acad. Sci. USA 83:3091-3095, 1986.

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Chemotactic/Chemokinetic Activity

A protein of the present invention may have chemotactic or chemokinetic activity (e.g., act as a chemokine) for mammalian cells, including, for example, monocytes, fibroblasts, neutrophils, T-cells, mast cells, eosinophils, epithelial and/or endothelial cells.
20 Chemotactic and chemokinetic proteins can be used to mobilize or attract a desired cell population to a desired site of action. Chemotactic or chemokinetic proteins provide particular advantages in treatment of wounds and other trauma to tissues, as well as in treatment of localized infections. For example, attraction of lymphocytes, monocytes or neutrophils to tumors or sites of infection may result in improved immune responses against
25 the tumor or infecting agent.

A protein or peptide has chemotactic activity for a particular cell population if it can stimulate, directly or indirectly, the directed orientation or movement of such cell population. Preferably, the protein or peptide has the ability to directly stimulate directed movement of cells. Whether a particular protein has chemotactic activity for a population
30 of cells can be readily determined by employing such protein or peptide in any known assay for cell chemotaxis.

The activity of a protein of the invention may, among other means, be measured by the following methods:

Assays for chemotactic activity (which will identify proteins that induce or prevent chemotaxis) consist of assays that measure the ability of a protein to induce the migration of cells across a membrane as well as the ability of a protein to induce the adhesion of one cell population to another cell population. Suitable assays for movement and adhesion 5 include, without limitation, those described in: Current Protocols in Immunology, Ed by J.E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W. Strober, Pub. Greene Publishing Associates and Wiley-Interscience (Chapter 6.12, Measurement of alpha and beta Chemokines 6.12.1-6.12.28; Taub et al. J. Clin. Invest. 95:1370-1376, 1995; Lind et al. APMIS 103:140-146, 1995; Muller et al Eur. J. Immunol. 25: 1744-1748; Gruber et al. 10 J. of Immunol. 152:5860-5867, 1994; Johnston et al. J. of Immunol. 153: 1762-1768, 1994.

Hemostatic and Thrombolytic Activity

A protein of the invention may also exhibit hemostatic or thrombolytic activity. As a result, such a protein is expected to be useful in treatment of various coagulation disorders 15 (including hereditary disorders, such as hemophilias) or to enhance coagulation and other hemostatic events in treating wounds resulting from trauma, surgery or other causes. A protein of the invention may also be useful for dissolving or inhibiting formation of thromboses and for treatment and prevention of conditions resulting therefrom (such as, for example, infarction of cardiac and central nervous system vessels (e.g., stroke).

20 The activity of a protein of the invention may, among other means, be measured by the following methods:

Assay for hemostatic and thrombolytic activity include, without limitation, those described in: Linet et al., J. Clin. Pharmacol. 26:131-140, 1986; Burdick et al., Thrombosis Res. 45:413-419, 1987; Humphrey et al., Fibrinolysis 5:71-79 (1991); Schaub, 25 Prostaglandins 35:467-474, 1988.

Receptor/Ligand Activity

A protein of the present invention may also demonstrate activity as receptors, receptor ligands or inhibitors or agonists of receptor/ligand interactions. Examples of such 30 receptors and ligands include, without limitation, cytokine receptors and their ligands, receptor kinases and their ligands, receptor phosphatases and their ligands, receptors involved in cell-cell interactions and their ligands (including without limitation, cellular adhesion molecules (such as selectins, integrins and their ligands) and receptor/ligand pairs involved in antigen presentation, antigen recognition and development of cellular and

humoral immune responses). Receptors and ligands are also useful for screening of potential peptide or small molecule inhibitors of the relevant receptor/ligand interaction. A protein of the present invention (including, without limitation, fragments of receptors and ligands) may themselves be useful as inhibitors of receptor/ligand interactions.

- 5 The activity of a protein of the invention may, among other means, be measured by the following methods:

Suitable assays for receptor-ligand activity include without limitation those described in: Current Protocols in Immunology, Ed by J.E. Coligan, A.M. Kruisbeek, D.H. Margulies, E.M. Shevach, W. Strober, Pub. Greene Publishing Associates and 10 Wiley-Interscience (Chapter 7.28, Measurement of Cellular Adhesion under static conditions 7.28.1-7.28.22), Takai et al., Proc. Natl. Acad. Sci. USA 84:6864-6868, 1987; Bierer et al., J. Exp. Med. 168:1145-1156, 1988; Rosenstein et al., J. Exp. Med. 169:149-160 1989; Stoltenborg et al., J. Immunol. Methods 175:59-68, 1994; Stitt et al., Cell 80:661-670, 1995.

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Anti-Inflammatory Activity

Proteins of the present invention may also exhibit anti-inflammatory activity. The anti-inflammatory activity may be achieved by providing a stimulus to cells involved in the inflammatory response, by inhibiting or promoting cell-cell interactions (such as, for 20 example, cell adhesion), by inhibiting or promoting chemotaxis of cells involved in the inflammatory process, inhibiting or promoting cell extravasation, or by stimulating or suppressing production of other factors which more directly inhibit or promote an inflammatory response. Proteins exhibiting such activities can be used to treat inflammatory conditions including chronic or acute conditions), including without limitation 25 inflammation associated with infection (such as septic shock, sepsis or systemic inflammatory response syndrome (SIRS)), ischemia-reperfusion injury, endotoxin lethality, arthritis, complement-mediated hyperacute rejection, nephritis, cytokine or chemokine-induced lung injury, inflammatory bowel disease, Crohn's disease or resulting from over production of cytokines such as TNF or IL-1. Proteins of the invention may also be useful 30 to treat anaphylaxis and hypersensitivity to an antigenic substance or material.

Tumor Inhibition Activity

In addition to the activities described above for immunological treatment or prevention of tumors, a protein of the invention may exhibit other anti-tumor activities. A

protein may inhibit tumor growth directly or indirectly (such as, for example, via ADCC). A protein may exhibit its tumor inhibitory activity by acting on tumor tissue or tumor precursor tissue, by inhibiting formation of tissues necessary to support tumor growth (such as, for example, by inhibiting angiogenesis), by causing production of other factors, agents or cell types which inhibit tumor growth, or by suppressing, eliminating or inhibiting factors, agents or cell types which promote tumor growth.

Other Activities

- 1.0 A protein of the invention may also exhibit one or more of the following additional activities or effects: inhibiting the growth, infection or function of, or killing, infectious agents, including, without limitation, bacteria, viruses, fungi and other parasites; effecting (suppressing or enhancing) bodily characteristics, including, without limitation, height, weight, hair color, eye color, skin, fat to lean ratio or other tissue pigmentation, or organ or body part size or shape (such as, for example, breast augmentation or diminution, change in bone form or shape); effecting biorhythms or circadian cycles or rhythms; effecting the fertility of male or female subjects; effecting the metabolism, catabolism, anabolism, processing, utilization, storage or elimination of dietary fat, lipid, protein, carbohydrate, vitamins, minerals, cofactors or other nutritional factors or component(s); effecting behavioral characteristics, including, without limitation, appetite, libido, stress, cognition (including cognitive disorders), depression (including depressive disorders) and violent behaviors; providing analgesic effects or other pain reducing effects; promoting differentiation and growth of embryonic stem cells in lineages other than hematopoietic lineages; hormonal or endocrine activity; in the case of enzymes, correcting deficiencies of the enzyme and treating deficiency-related diseases; treatment of hyperproliferative disorders (such as, for example, psoriasis); immunoglobulin-like activity (such as, for example, the ability to bind antigens or complement); and the ability to act as an antigen in a vaccine composition to raise an immune response against such protein or another material or entity which is cross-reactive with such protein.
- 30

ADMINISTRATION AND DOSING

A protein of the present invention (from whatever source derived, including without limitation from recombinant and non-recombinant sources) may be used in a pharmaceutical

composition when combined with a pharmaceutically acceptable carrier. Such a composition may also contain (in addition to protein and a carrier) diluents, fillers, salts, buffers, stabilizers, solubilizers, and other materials well known in the art. The term "pharmaceutically acceptable" means a non-toxic material that does not interfere with the effectiveness of the biological activity of the active ingredient(s). The characteristics of the carrier will depend on the route of administration. The pharmaceutical composition of the invention may also contain cytokines, lymphokines, or other hematopoietic factors such as M-CSF, GM-CSF, TNF, IL-1, IL-2, IL-3, IL-4, IL-5, IL-6, IL-7, IL-8, IL-9, IL-10, IL-11, IL-12, IL-13, IL-14, IL-15, IFN, TNF₀, TNF₁, TNF₂, G-CSF, Meg-CSF, thrombopoietin, stem cell factor, and erythropoietin. The pharmaceutical composition may further contain other agents which either enhance the activity of the protein or compliment its activity or use in treatment. Such additional factors and/or agents may be included in the pharmaceutical composition to produce a synergistic effect with protein of the invention, or to minimize side effects. Conversely, protein of the present invention may be included in formulations of the particular cytokine, lymphokine, other hematopoietic factor, thrombolytic or anti-thrombotic factor, or anti-inflammatory agent to minimize side effects of the cytokine, lymphokine, other hematopoietic factor, thrombolytic or anti-thrombotic factor, or anti-inflammatory agent.

A protein of the present invention may be active in multimers (e.g., heterodimers or homodimers) or complexes with itself or other proteins. As a result, pharmaceutical compositions of the invention may comprise a protein of the invention in such multimeric or complexed form.

The pharmaceutical composition of the invention may be in the form of a complex of the protein(s) of present invention along with protein or peptide antigens. The protein and/or peptide antigen will deliver a stimulatory signal to both B and T lymphocytes. B lymphocytes will respond to antigen through their surface immunoglobulin receptor. T lymphocytes will respond to antigen through the T cell receptor (TCR) following presentation of the antigen by MHC proteins. MHC and structurally related proteins including those encoded by class I and class II MHC genes on host cells will serve to present the peptide antigen(s) to T lymphocytes. The antigen components could also be supplied as purified MHC-peptide complexes alone or with co-stimulatory molecules that can directly signal T cells. Alternatively antibodies able to bind surface immunoglobulin and other molecules on B cells as well as antibodies able to bind the TCR and other

molecules on T cells can be combined with the pharmaceutical composition of the invention.

The pharmaceutical composition of the invention may be in the form of a liposome in which protein of the present invention is combined, in addition to other pharmaceutically acceptable carriers, with amphipathic agents such as lipids which exist in aggregated form as micelles, insoluble monolayers, liquid crystals, or lamellar layers in aqueous solution. Suitable lipids for liposomal formulation include, without limitation, monoglycerides, diglycerides, sulfatides, lysolecithin, phospholipids, saponin, bile acids, and the like. Preparation of such liposomal formulations is within the level of skill in the art, as disclosed, for example, in U.S. Patent No. 4,235,871; U.S. Patent No. 4,501,728; U.S. Patent No. 4,837,028; and U.S. Patent No. 4,737,323, all of which are incorporated herein by reference.

As used herein, the term "therapeutically effective amount" means the total amount of each active component of the pharmaceutical composition or method that is sufficient to show a meaningful patient benefit, i.e., treatment, healing, prevention or amelioration of the relevant medical condition, or an increase in rate of treatment, healing, prevention or amelioration of such conditions. When applied to an individual active ingredient, administered alone, the term refers to that ingredient alone. When applied to a combination, the term refers to combined amounts of the active ingredients that result in the therapeutic effect, whether administered in combination, serially or simultaneously.

In practicing the method of treatment or use of the present invention, a therapeutically effective amount of protein of the present invention is administered to a mammal having a condition to be treated. Protein of the present invention may be administered in accordance with the method of the invention either alone or in combination with other therapies such as treatments employing cytokines, lymphokines or other hematopoietic factors. When co-administered with one or more cytokines, lymphokines or other hematopoietic factors, protein of the present invention may be administered either simultaneously with the cytokine(s), lymphokine(s), other hematopoietic factor(s), thrombolytic or anti-thrombotic factors, or sequentially. If administered sequentially, the attending physician will decide on the appropriate sequence of administering protein of the present invention in combination with cytokine(s), lymphokine(s), other hematopoietic factor(s), thrombolytic or anti-thrombotic factors.

Administration of protein of the present invention used in the pharmaceutical composition or to practice the method of the present invention can be carried out in a

variety of conventional ways, such as oral ingestion, inhalation, topical application or cutaneous, subcutaneous, intraperitoneal, parenteral or intravenous injection. Intravenous administration to the patient is preferred.

- When a therapeutically effective amount of protein of the present invention is
- 5 administered orally, protein of the present invention will be in the form of a tablet, capsule, powder, solution or elixir. When administered in tablet form, the pharmaceutical composition of the invention may additionally contain a solid carrier such as a gelatin or an adjuvant. The tablet, capsule, and powder contain from about 5 to 95% protein of the present invention, and preferably from about 25 to 90% protein of the present invention.
- 10 When administered in liquid form, a liquid carrier such as water, petroleum, oils of animal or plant origin such as peanut oil, mineral oil, soybean oil, or sesame oil, or synthetic oils may be added. The liquid form of the pharmaceutical composition may further contain physiological saline solution, dextrose or other saccharide solution, or glycols such as ethylene glycol, propylene glycol or polyethylene glycol. When administered in liquid
- 15 form, the pharmaceutical composition contains from about 0.5 to 90% by weight of protein of the present invention, and preferably from about 1 to 50% protein of the present invention.

- When a therapeutically effective amount of protein of the present invention is administered by intravenous, cutaneous or subcutaneous injection, protein of the present
- 20 invention will be in the form of a pyrogen-free, parenterally acceptable aqueous solution. The preparation of such parenterally acceptable protein solutions, having due regard to pH, isotonicity, stability, and the like, is within the skill in the art. A preferred pharmaceutical composition for intravenous, cutaneous, or subcutaneous injection should contain, in addition to protein of the present invention, an isotonic vehicle such as Sodium Chloride
- 25 Injection, Ringer's Injection, Dextrose Injection, Dextrose and Sodium Chloride Injection, Lactated Ringer's Injection, or other vehicle as known in the art. The pharmaceutical composition of the present invention may also contain stabilizers, preservatives, buffers, antioxidants, or other additives known to those of skill in the art.

- The amount of protein of the present invention in the pharmaceutical composition
- 30 of the present invention will depend upon the nature and severity of the condition being treated, and on the nature of prior treatments which the patient has undergone. Ultimately, the attending physician will decide the amount of protein of the present invention with which to treat each individual patient. Initially, the attending physician will administer low doses of protein of the present invention and observe the patient's response. Larger doses

of protein of the present invention may be administered until the optimal therapeutic effect is obtained for the patient, and at that point the dosage is not increased further. It is contemplated that the various pharmaceutical compositions used to practice the method of the present invention should contain about 0.01 μ g to about 100 mg (preferably about 0.1 μ g
5 to about 10 mg, more preferably about 0.1 μ g to about 1 mg) of protein of the present invention per kg body weight.

The duration of intravenous therapy using the pharmaceutical composition of the present invention will vary, depending on the severity of the disease being treated and the condition and potential idiosyncratic response of each individual patient. It is contemplated
10 that the duration of each application of the protein of the present invention will be in the range of 12 to 24 hours of continuous intravenous administration. Ultimately the attending physician will decide on the appropriate duration of intravenous therapy using the pharmaceutical composition of the present invention.

Protein of the invention may also be used to immunize animals to obtain polyclonal
15 and monoclonal antibodies which specifically react with the protein. Such antibodies may be obtained using either the entire protein or fragments thereof as an immunogen. The peptide immunogens additionally may contain a cysteine residue at the carboxyl terminus, and are conjugated to a hapten such as keyhole limpet hemocyanin (KLH). Methods for synthesizing such peptides are known in the art, for example, as in R.P. Merrifield, J.
20 Amer.Chem.Soc. 85, 2149-2154 (1963); J.L. Krstenansky, *et al.*, FEBS Lett. 211, 10 (1987). Monoclonal antibodies binding to the protein of the invention may be useful diagnostic agents for the immunodetection of the protein. Neutralizing monoclonal antibodies binding to the protein may also be useful therapeutics for both conditions associated with the protein and also in the treatment of some forms of cancer where
25 abnormal expression of the protein is involved. In the case of cancerous cells or leukemic cells, neutralizing monoclonal antibodies against the protein may be useful in detecting and preventing the metastatic spread of the cancerous cells, which may be mediated by the protein.

For compositions of the present invention which are useful for bone, cartilage,
30 tendon or ligament regeneration, the therapeutic method includes administering the composition topically, systematically, or locally as an implant or device. When administered, the therapeutic composition for use in this invention is, of course, in a pyrogen-free, physiologically acceptable form. Further, the composition may desirably be encapsulated or injected in a viscous form for delivery to the site of bone, cartilage or tissue

damage. Topical administration may be suitable for wound healing and tissue repair. Therapeutically useful agents other than a protein of the invention which may also optionally be included in the composition as described above, may alternatively or additionally, be administered simultaneously or sequentially with the composition in the methods of the invention. Preferably for bone and/or cartilage formation, the composition would include a matrix capable of delivering the protein-containing composition to the site of bone and/or cartilage damage, providing a structure for the developing bone and cartilage and optimally capable of being resorbed into the body. Such matrices may be formed of materials presently in use for other implanted medical applications.

- 10 The choice of matrix material is based on biocompatibility, biodegradability, mechanical properties, cosmetic appearance and interface properties. The particular application of the compositions will define the appropriate formulation. Potential matrices for the compositions may be biodegradable and chemically defined calcium sulfate, tricalciumphosphate, hydroxyapatite, polylactic acid, polyglycolic acid and polyanhydrides.
- 15 Other potential materials are biodegradable and biologically well-defined, such as bone or dermal collagen. Further matrices are comprised of pure proteins or extracellular matrix components. Other potential matrices are nonbiodegradable and chemically defined, such as sintered hydroxapatite, bioglass, aluminates, or other ceramics. Matrices may be comprised of combinations of any of the above mentioned types of material, such as
- 20 polylactic acid and hydroxyapatite or collagen and tricalciumphosphate. The bioceramics may be altered in composition, such as in calcium-aluminate-phosphate and processing to alter pore size, particle size, particle shape, and biodegradability.

Presently preferred is a 50:50 (mole weight) copolymer of lactic acid and glycolic acid in the form of porous particles having diameters ranging from 150 to 800 microns. In some applications, it will be useful to utilize a sequestering agent, such as carboxymethyl cellulose or autologous blood clot, to prevent the protein compositions from disassociating from the matrix.

A preferred family of sequestering agents is cellulosic materials such as alkylcelluloses (including hydroxyalkylcelluloses), including methylcellulose, ethylcellulose, hydroxyethylcellulose, hydroxypropylcellulose, hydroxypropyl-methylcellulose, and carboxymethylcellulose, the most preferred being cationic salts of carboxymethylcellulose (CMC). Other preferred sequestering agents include hyaluronic acid, sodium alginate, poly(ethylene glycol), polyoxyethylene oxide, carboxyvinyl polymer and poly(vinyl alcohol). The amount of sequestering agent useful herein is 0.5-20 wt%, preferably 1-10

wt% based on total formulation weight, which represents the amount necessary to prevent desorption of the protein from the polymer matrix and to provide appropriate handling of the composition, yet not so much that the progenitor cells are prevented from infiltrating the matrix, thereby providing the protein the opportunity to assist the osteogenic activity of the progenitor cells.

In further compositions, proteins of the invention may be combined with other agents beneficial to the treatment of the bone and/or cartilage defect, wound, or tissue in question. These agents include various growth factors such as epidermal growth factor (EGF), platelet derived growth factor (PDGF), transforming growth factors (TGF- α and TGF- β), and insulin-like growth factor (IGF).

The therapeutic compositions are also presently valuable for veterinary applications. Particularly domestic animals and thoroughbred horses, in addition to humans, are desired patients for such treatment with proteins of the present invention.

The dosage regimen of a protein-containing pharmaceutical composition to be used in tissue regeneration will be determined by the attending physician considering various factors which modify the action of the proteins, e.g., amount of tissue weight desired to be formed, the site of damage, the condition of the damaged tissue, the size of a wound, type of damaged tissue (e.g., bone), the patient's age, sex, and diet, the severity of any infection, time of administration and other clinical factors. The dosage may vary with the type of matrix used in the reconstitution and with inclusion of other proteins in the pharmaceutical composition. For example, the addition of other known growth factors, such as IGF I (insulin like growth factor I), to the final composition, may also effect the dosage. Progress can be monitored by periodic assessment of tissue/bone growth and/or repair, for example, X-rays, histomorphometric determinations and tetracycline labeling.

Polynucleotides of the present invention can also be used for gene therapy. Such polynucleotides can be introduced either *in vivo* or *ex vivo* into cells for expression in a mammalian subject. Polynucleotides of the invention may also be administered by other known methods for introduction of nucleic acid into a cell or organism (including, without limitation, in the form of viral vectors or naked DNA).

Cells may also be cultured *ex vivo* in the presence of proteins of the present invention in order to proliferate or to produce a desired effect on or activity in such cells. Treated cells can then be introduced *in vivo* for therapeutic purposes.

Patent and literature references cited herein are incorporated by reference as if fully set forth.

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(iii) NUMBER OF SEQUENCES: 59

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(A) MEDIUM TYPE: Floppy disk
(B) COMPUTER: IBM PC compatible
(C) OPERATING SYSTEM: PC-DOS/MS-DOS
(D) SOFTWARE: PatentIn Release #1.0, Version #1.30

(vi) CURRENT APPLICATION DATA:

(A) APPLICATION NUMBER:
(B) FILING DATE:
(C) CLASSIFICATION:

(viii) ATTORNEY/AGENT INFORMATION:

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(C) REFERENCE/DOCKET NUMBER: GI6001

(ix) TELECOMMUNICATION INFORMATION:

(A) TELEPHONE: (617) 498-8224
(B) TELEFAX: (617) 876-5851

(2) INFORMATION FOR SEQ ID NO:1:

(i) SEQUENCE CHARACTERISTICS:

(A) LENGTH: 505 base pairs
(B) TYPE: nucleic acid
(C) STRANDEDNESS: double
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

| | |
|--|-----|
| GAATTCCGCA CGAGGGCGCG GGGTCCGYWA TGCCGSCGGC AGCCGAAGGC GTACTGGCGA | 60 |
| CCCGGAGTGA TGAGCCCCGCC CGAGACGATG CCSCCGTGGA GACAGCTGAG GAARCAAAGG | 120 |
| AGCCTGCTGA AAGCTGACAT CACTGAGCTC TGCCGGACA TGTTCTCCAA AATGCCACT | 180 |
| TACCTGACTG GGGAACTGAC GCCACCAGT GAAGACTATA AGCTCCTGGA AAATATGAAT | 240 |
| AAACTCACCA GCTTGAGTA TYTTGAAATG AAAGATATTG CTATAAACAT TAGTAGGAAC | 300 |
| TTAAAGGACT TAAACCAGAA ATATGCTGGA CTGCAGCCTT ATYTGATTG AGATTCAATG | 360 |
| TTCATTTGAA GAGCAGGTAG CAGCTTTTG AGCAGGCAGC TTACAAGTTG GRTGEMTWTT | 420 |
| TCAAAAAAAAN TGGAANCCCA AGTACAAGAA GNTGGAGAAG CGATGAGAAA ATTATTTTA | 480 |
| TGGGACACAG TTTTTTTTTT TTAAT | 505 |

(2) INFORMATION FOR SEQ ID NO:2:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 145 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear
- (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

| | | | |
|---|-----|-----|----|
| Met Ser Pro Pro Glu Thr Met Pro Pro Trp Arg Gln Leu Arg Lys Gln | | | |
| 1 | 5 | 10 | 15 |
| Arg Ser Leu Leu Lys Ala Asp Ile Thr Glu Leu Cys Arg Asp Met Phe | | | |
| 20 | 25 | 30 | |
| Ser Lys Met Ala Thr Tyr Leu Thr Gly Glu Leu Thr Ala Thr Ser Glu | | | |
| 35 | 40 | 45 | |
| Asp Tyr Lys Leu Leu Glu Asn Met Asn Lys Leu Thr Ser Leu Lys Tyr | | | |
| 50 | 55 | 60 | |
| Xaa Glu Met Lys Asp Ile Ala Ile Asn Ile Ser Arg Asn Leu Lys Asp | | | |
| 65 | 70 | 75 | 80 |
| Leu Asn Gln Lys Tyr Ala Gly Leu Gln Pro Tyr Leu Asp Ser Asp Ser | | | |
| 85 | 90 | 95 | |
| Met Phe Ile Gly Arg Ala Gly Ser Ser Phe Leu Ser Arg Gln Leu Thr | | | |
| 100 | 105 | 110 | |
| Ser Trp Xaa Xaa Xaa Ser Lys Lys Xaa Glu Xaa Gln Val Gln Glu Xaa | | | |
| 115 | 120 | 125 | |
| Gly Glu Ala Met Arg Lys Leu Phe Leu Trp Asp Arg Val Phe Phe Phe | | | |
| 130 | 135 | 140 | |
| Xaa | | | |
| 145 | | | |

(2) INFORMATION FOR SEQ ID NO:3:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 315 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

| | |
|--|-----|
| GCAGCTTATC ACCTTGTGAA TGTGGTAAC TTACTTTCC ATAATATTGC AAATAACATA | 60 |
| AAATNTTAAA ATAATTCAA GCTGAGTTT CTAGATTGAG CAGAAATGGT GAAAGGAGTA | 120 |
| TTGATAACCTT GGCGTATGTG ATGGGCCCT CTTGTTATT TTNTATGTGA GTCACATTGA | 180 |
| CATGCGATCA GTTGGGAA ATGTGATGAA AACAAAGACT AGATGGGTAT GTGTGTTAT | 240 |
| GTGTTGGGTA GGGAGGTGAC GATTGCCANT CATANAATAA AGGATTTAT AAAATACCAA | 300 |
| AAAAAAAAAA AAAAAA | 315 |

(2) INFORMATION FOR SEQ ID NO:4:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 867 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:4:

| | |
|--|-----|
| GTCAGTNTGA GTNAGAAAAT NGAATCCATC ATCTAACAGA GANTTCATC CAGAAACAGR | 60 |
| CCATGYTGGAA GAGTCTCAGC ACAGAAAAGA ACTNCCTGGT CTTTCAACTG GAGCGCCTCG | 120 |
| AACAGCAGAT GAACTCCGCC TCTGGAAAGTA GTAGTAATGG GTCTTCGATT AATATGTCTG | 180 |
| GAATTGACAA TGGTGAAGGC ACTCGTCTGC GAATGTTCCCT GTTCTTTTA ATGACACAGA | 240 |
| AACTAATCTG GCAGGAATGT ACGGAAAAGT TCGCAAAGCT GCTAGTTCAA TTGATCAGTT | 300 |
| TAGTATTCTGC CTGGGNAATT TTTCTCCGAA GATACCCAT AGCGGAGTT TTTGTAATTA | 360 |
| TATATATGGC TTGCTTCAC CTCTGGGTNA TGATTGTTCT GTTGACTTAC ACACCAGAAA | 420 |
| TGCACCACGA CCAACCATAT GGCAAATGAA CCAAGCCCAG TTGTTGCAGT GATTGGTTGT | 480 |
| CTTTTTYTAG ACTTGGGATY TGCAAGAAGG CCAATTGCCT AAAATTTTG AGAACAGTGC | 540 |
| ACAAGATTAT TTTATCANTA CAAGNTTTA AANTTTTAA GTTATTGNAN AAGTATTAA | 600 |

| | |
|--|-----|
| CCTAAATTTT CCAATTTCCT TTAAATGGTA AGAGTTTTA AAACAGACAA TAATTTAAC | 660 |
| AGNTCAGNTT TGCTTTATTT GAGTTAGTG GTCTTAATAT ATATGTAGAG AAAGATGGTG | 720 |
| GGGTTGTTCA CCTCTGTACA GGACCTTTG TATGTTAGGN GACATTGATT ATGGGTTATA | 780 |
| ATCAGGGAAA CTAATTGTAT TTAGTGACAA AAATAAAAAG NTTTTTTTT TATNAAAAAA | 840 |
| AAAAAAAAAA AAAAAAAAAA AATTATT | 867 |

(2) INFORMATION FOR SEQ ID NO:5:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 212 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

| | | | |
|---|-----|-----|-----|
| Met Thr Gln Lys Leu Ile Trp Gln Glu Cys Thr Glu Lys Phe Ala Lys | | | |
| 1 | 5 | 10 | 15 |
| Leu Leu Val Gln Leu Ile Ser Leu Val Phe Ala Trp Xaa Ile Phe Leu | | | |
| 20 | 25 | 30 | |
| Arg Arg Tyr Pro Ile Ala Arg Val Phe Val Ile Ile Tyr Met Ala Leu | | | |
| 35 | 40 | 45 | |
| Leu His Leu Trp Val Met Ile Val Leu Leu Thr Tyr Thr Pro Glu Met | | | |
| 50 | 55 | 60 | |
| His His Asp Gln Pro Tyr Gly Lys Xaa Thr Lys Pro Ser Cys Cys Ser | | | |
| 65 | 70 | 75 | 80 |
| Asp Trp Leu Ser Phe Xaa Arg Leu Gly Ile Cys Lys Lys Ala Asn Cys | | | |
| 85 | 90 | 95 | |
| Leu Lys Phe Leu Arg Thr Val His Lys Ile Ile Leu Ser Xaa Gln Xaa | | | |
| 100 | 105 | 110 | |
| Phe Lys Xaa Phe Lys Leu Leu Xaa Lys Tyr Phe Thr Xaa Ile Phe Gln | | | |
| 115 | 120 | 125 | |
| Phe Pro Leu Asn Gly Lys Ser Phe Xaa Asn Arg Gln Xaa Phe Asn Lys | | | |
| 130 | 135 | 140 | |
| Xaa Xaa Phe Ala Leu Phe Glu Phe Ser Gly Pro Asn Ile Tyr Val Glu | | | |
| 145 | 150 | 155 | 160 |
| Lys Asp Gly Gly Val Val His Leu Cys Thr Gly Pro Phe Val Cys Xaa | | | |
| 165 | 170 | 175 | |
| Xaa Thr Leu Ile Met Gly Tyr Asn Gln Gly Asn | | | |

(2) INFORMATION FOR SEQ ID NO:6:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 491 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: double
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

| | |
|--|-----|
| CAGGATATTA GAAATGGCTA CTCCCCAGTC AATTTCATC TTTGCAATCT GCATTTAAC | 60 |
| GATAACAGAA TTAATTCTGG CCTCAAAAAG CTACTATGAT ATCTTAGGTG TGCCAAAATC | 120 |
| GGCATCAGAG CGCCAAATCA AGAAGGCCTT TCACAAGTTG GCCATGAAGT ACCACCCCTGA | 180 |
| CAAAAATAAG AGCCCCGATG CTGAAGCAAA ATTCAAGAGAG ATTGCAGAAG CATATGAAAC | 240 |
| ACTCTCAGAT GCTAATAGNA CGAAAAGAGT ATGATACACT TGGACACAGT GCTTTTACTA | 300 |
| GTGGGTAAAG GGACAARGRR GTAGTTGGR A GTTCTTTGA GYRNKCNKTT MNYTTTYAAYT | 360 |
| TTSATGACTT ATTTAAAGAC TTTGGCTTTT TTGGTYNARR CYAAAACAYT GGAKCYAANA | 420 |
| AYKTTTTGRR RWYCawanYCC NNACACCCNN NWKGGTksyc CAGGNGGCGT TTTTTGNAA | 480 |
| TTCCTTTTCC C | 491 |

(2) INFORMATION FOR SEQ ID NO:7:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 159 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

| | | | |
|---|----|----|----|
| Met Ala Thr Pro Gln Ser Ile Phe Ile Phe Ala Ile Cys Ile Leu Met | | | |
| 1 | 5 | 10 | 15 |
| Ile Thr Glu Leu Ile Leu Ala Ser Lys Ser Tyr Tyr Asp Ile Leu Gly | | | |
| 20 | 25 | 30 | |
| Val Pro Lys Ser Ala Ser Glu Arg Gln Ile Lys Lys Ala Phe His Lys | | | |
| 35 | 40 | 45 | |
| Leu Ala Met Lys Tyr His Pro Asp Lys Asn Lys Ser Pro Asp Ala Glu | | | |
| 50 | 55 | 60 | |
| Ala Lys Phe Arg Glu Ile Ala Glu Ala Tyr Glu Thr Leu Ser Asp Ala | | | |
| 65 | 70 | 75 | 80 |
| Asn Xaa Thr Lys Arg Val Xaa Tyr Thr Trp Thr Gln Cys Phe Tyr Xaa | | | |

| | | |
|---|-----|-----|
| 85 | 90 | 95 |
| Trp Val Lys Gly Gln Xaa Xaa Ser Trp Xaa Phe Phe Xaa Xaa Xaa Xaa | | |
| 100 | 105 | 110 |
| Xaa Xaa Xaa Xaa Xaa Xaa Leu Ile Xaa Arg Leu Trp Leu Phe Trp Xaa | | |
| 115 | 120 | 125 |
| Xaa Xaa Lys His Trp Xaa Xaa Xaa Phe Xaa Xaa Xaa Xaa Xaa Thr | | |
| 130 | 135 | 140 |
| Pro Xaa Xaa Val Xaa Gln Xaa Ala Phe Phe Xaa Asn Ser Phe Ser | | |
| 145 | 150 | 155 |

(2) INFORMATION FOR SEQ ID NO:8:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 242 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

| | |
|--|-----|
| CTTAATCTAG AGATTGACTG ANACCTCATT CTGTTNGTAA AACCAGCCAG TAATTTCTGT | 60 |
| GCAACCTTAC TATGTGCAAT ATTTTTAAAT CCTGAGAAAAT GTGTGCTTTT GTTTTCGGAT | 120 |
| AGACTTATTT CTTTAGTTCT GCACCTTTCC ACATTATACT CCATATGAGT ATTAATCCTA | 180 |
| TGGATAACAT ATTAAAACAA GTGTCTCATA AAAAAAAA AAAAAAAATT NCCTGCGGCC | 240 |
| GC | 242 |

(2) INFORMATION FOR SEQ ID NO:9:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 607 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:9:

| | |
|---|-----|
| GAATTNCNG CCCTACAGCA CGGCCCTGCC CCAAGGACTT TTGNTGTCCT TGGCCAGTTT | 60 |
| CTGGTGCTAA AGAAAAGATN RAARACCTCT TCCGGGAATG GCTGAAAGAC ACTTGTGGCG | 120 |
| CCAACGCCAA GCAGTCCGG GACTGCTTCG GATGCCTTCG AGACTGGTGC GACGCCCTCT | 180 |
| KGTGATGCTC TCTGGGAARC TCTCAATCCC CAGCCCTCAT CCAGAGTTTG CAGCCGAGTA | 240 |

| | |
|---|-----|
| GGGACTCNC CCCTGTCHTT TACGAAGGAA AAGATTGCTA TTGTCGTA CACNTCNGAC | 300 |
| GTANTCCGGG GTNTTTGGG AGTTTTCTCC CCTAACCAT TCAACTTTT TTGGATTHTC | 360 |
| GNTCTTGAT GCCTCCCCG TCCTTTTCC CTTGCCAGTT CCCTGGTGAA CAGTTTACCA | 420 |
| GCTTTCCCTG AATGGATTNC CGGSCCCCAT CCCTCACCCC CACCYTCAAT TTCAATTCCG | 480 |
| TTTGATAMC ATTGKGGYTC CTTTTTGGC AGAACAGTCA MTGTCCTGT AAAGTTTTT | 540 |
| AGATCAATAA AGTCAGTGGC TTTCAAAAAN GNAAAAAAA AAAAAAAA AAAAAAAGGG | 600 |
| CGCCGC | 607 |

(2) INFORMATION FOR SEQ ID NO:10:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 202 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:10:

| | | | |
|---|-----|-----|----|
| Glu Phe Xaa Ala Leu Gln His Gly Pro Ala Pro Arg Thr Phe Xaa Val | | | |
| 1 | 5 | 10 | 15 |
| Leu Gly Gln Phe Leu Val Leu Lys Lys Arg Xaa Lys Thr Ser Ser Gly | | | |
| 20 | 25 | 30 | |
| Asn Gly Xaa Lys Thr Leu Val Ala Pro Thr Pro Ser Ser Pro Gly Thr | | | |
| 35 | 40 | 45 | |
| Ala Ser Asp Ala Phe Glu Ser Gly Ala Thr Pro Ser Xaa Asp Ala Leu | | | |
| 50 | 55 | 60 | |
| Trp Glu Xaa Leu Asn Pro Gln Pro Ser Ser Arg Val Cys Ser Arg Val | | | |
| 65 | 70 | 75 | 80 |
| Gly Thr Xaa Pro Leu Ser Phe Thr Lys Glu Lys Ile Ala Ile Val Val | | | |
| 85 | 90 | 95 | |
| Leu Thr Ser Asp Val Xaa Arg Gly Xaa Leu Gly Val Phe Ser Pro Asn | | | |
| 100 | 105 | 110 | |
| His Phe Asn Phe Phe Trp Ile Xaa Xaa Leu Ala Cys Leu Pro Arg Pro | | | |
| 115 | 120 | 125 | |
| Phe Ser Leu Ala Ser Ser Leu Val Asn Ser Leu Pro Ala Phe Pro Glu | | | |
| 130 | 135 | 140 | |
| Trp Ile | | | |

(2) INFORMATION FOR SEQ ID NO:11:

- (i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 462 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

| | |
|--|-----|
| AGCTTGAAR AARRATGAAA TTCCTTATCT TCGCATTTC CCGTGGTGT CACCTTTAT | 60 |
| CCCTGTGCTC TGGGAAAGCT ATATGCAAGA ATGGCATCTC TAAGAGGACT TTTGAAGAAA | 120 |
| TAAAAAGAAGA AATAGGCCAGC TGTTGGAGATG TTGCTAAAGC AATCATCAAC CTAGCTGTTT | 180 |
| ATGGTAAAGC CCAGAACAGA TCCTATGAGC GATTGGCACT TCTGGTTGAT ACTGTTGGAC | 240 |
| CCAGACTGAG TGGCTCCAAG AACCTAGRAA AAAGCCATCC AAATTATGTA CCAAAACCTG | 300 |
| GCAGGCAAGA TGGGGCTGGG AGGAAAGTTC ACCTGGGGAG CCAGTGAGGA ATACCCCAC | 360 |
| GGGGAGGAGG GGGGAGAAGG ATNCAGCTGT TGATNGCTGG GAGCCCAAGG ATTCATTAA | 420 |
| GGTTAGGCCN TCCTGGGTC TTTTGGCCAG CCAGCNTTTG GG | 462 |

(2) INFORMATION FOR SEQ ID NO:12:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 149 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

| | |
|---|--|
| Met Lys Phe Leu Ile Phe Ala Phe Phe Gly Gly Val His Leu Leu Ser | |
| 1 5 10 15 | |
| Leu Cys Ser Gly Lys Ala Ile Cys Lys Asn Gly Ile Ser Lys Arg Thr | |
| 20 25 30 | |
| Phe Glu Glu Ile Lys Glu Glu Ile Ala Ser Cys Gly Asp Val Ala Lys | |
| 35 40 45 | |
| Ala Ile Ile Asn Leu Ala Val Tyr Gly Lys Ala Gln Asn Arg Ser Tyr | |
| 50 55 60 | |
| Glu Arg Leu Ala Leu Leu Val Asp Thr Val Gly Pro Arg Leu Ser Gly | |
| 65 70 75 80 | |
| Ser Lys Asn Leu Xaa Lys Ser His Pro Asn Tyr Val Pro Lys Pro Gly | |
| 85 90 95 | |
| Arg Gln Asp Gly Ala Gly Arg Lys Val His Leu Gly Ser Gln Xaa Gly | |

| | | |
|-----|-----|-----|
| 100 | 105 | 110 |
|-----|-----|-----|

| | | |
|---|-----|-----|
| Ile Pro His Trp Gly Gly Gly Arg Arg Xaa Gln Leu Leu Xaa Ala | | |
| 115 | 120 | 125 |

| | | |
|---|-----|-----|
| Gly Ser Pro Arg Ile Ser Leu Arg Leu Gly Xaa Pro Gly Val Phe Trp | | |
| 130 | 135 | 140 |

| | |
|---------------------|--|
| Pro Ala Ser Xaa Trp | |
| 145 | |

(2) INFORMATION FOR SEQ ID NO:13:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 360 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

| | |
|--|-----|
| AGAAACAGTA AGAAAGAAC GTTTCATGN TTCTGGCCAG GAATCCTGGG TCTGCAACTT | 60 |
| NGGAAAACTC NTCTTCACAT AACAAATTCA TCCAATTCA NTTCAAAGCA CAACTNTATT | 120 |
| TCATGCTTTC TGNNANNATA TTTCTTGATA CTTTCAAAT TCTCTGATTC TAGAAAAAGG | 180 |
| AATCATTNTC CCCTCCCTCC CACCACATAG AATCACATA TGGTAGGGAT TACAGTGGGG | 240 |
| GCATTTCTT ATATCACCTC TTAAAAACAT TGTTCACAT TTAAAAGTAA ACACTTAATA | 300 |
| AATTTTGGA AGATCTCTGA AAAAAAAAAA AAAAAAAAAA AAAAATTNCC TGCGGCCGCA | 360 |

(2) INFORMATION FOR SEQ ID NO:14:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 519 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

| | |
|--|-----|
| AAGCTTGGCA CGAGGGGACC CGGCCTCTC CCCGTGCTCT CTCCACGACT CGCTCGGCC | 60 |
| CTCTGGAATA AAACACCCGC GAGCCCCGAG GGCCCAGAGG AGGCCGACGT GCCCCGAGCTC | 120 |
| CTCCGGGGGT CCCGCCCCGCG AGCTTCTTC TCGCCTCGC ATCTCCTCCT CGCGCGTCTT | 180 |
| GGACATGCCA GGAATAAAAA GGATACTCAC TGTTACCATT CTGGCTCTCT GTCTTCCAAG | 240 |
| CCCTGGGAAT GCACAGGCAC AGTGCACGAA TGGCTTGAC CTGGATCGCC AGTCAGGACA | 300 |

| | |
|--|-----|
| GTGTTTAGAT ATTGATGAAT GCCGAACCAT CCCCAGGCC TGCCGAGGAG ACATGATGTG | 360 |
| TGTTAACCAA AATGGCGGGT ATTTATGCAT TCCCCGGACA AACCTGTGT ATCGAGGCC | 420 |
| NTACTCGAAC CCCTACTCGA CCCCTTAYTC AGGTCCGTAACCCAGCAGYT GGCCCCACCA | 480 |
| YTTTACAGYT CAAAYTTTC CAAKGTTTT CAGGGTTT | 519 |

(2) INFORMATION FOR SEQ ID NO:15:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 111 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:15:

| | | | |
|---|-----|-----|----|
| Met Pro Gly Ile Lys Arg Ile Leu Thr Val Thr Ile Leu Ala Leu Cys | | | |
| 1 | 5 | 10 | 15 |
| Leu Pro Ser Pro Gly Asn Ala Gln Ala Gln Cys Thr Asn Gly Phe Asp | | | |
| 20 | 25 | 30 | |
| Leu Asp Arg Gln Ser Gly Gln Cys Leu Asp Ile Asp Glu Cys Arg Thr | | | |
| 35 | 40 | 45 | |
| Ile Pro Glu Ala Cys Arg Gly Asp Met Met Cys Val Asn Gln Asn Gly | | | |
| 50 | 55 | 60 | |
| Gly Tyr Leu Cys Ile Pro Arg Thr Asn Pro Val Tyr Arg Gly Pro Tyr | | | |
| 65 | 70 | 75 | 80 |
| Ser Asn Pro Tyr Ser Thr Pro Tyr Ser Gly Pro Xaa Pro Ser Ser Trp | | | |
| 85 | 90 | 95 | |
| Pro His His Phe Thr Xaa Pro Asn Phe Pro Xaa Phe Phe Arg Val | | | |
| 100 | 105 | 110 | |

(2) INFORMATION FOR SEQ ID NO:16:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 54 base pairs

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 536 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:17:

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| GTGGAATTC | TGGTAGTGT | GATNTTGTT | TGTATCCTT | TAAGTACTGT | TGATCAGTT | 60 |
| NGACACTTAC | TGGTTAAACT | TACGTTGCTA | AAGATTCTC | TATAATAAGC | CACACATTAT | 120 |
| ATTTAGACTA | TATTAAGGGA | CCTTGGTTT | CTTCTAGATA | GCAGCTGTCC | CAAAGAAAAT | 180 |
| ATTTCTCTT | TGTCTGTTAA | GATTTAGCTA | TTATCTGCCA | GTGTTAAGA | GGTTTGTT | 240 |
| CCAAACTCAA | CCAGCAATGT | TGAGAGCTGA | ACTTAAGATA | GCTGTTGTAC | TTTTGCTTT | 300 |
| CCATCTGTTA | CTGTCCTTCA | TTCTTGGCTC | CCTACTATCT | ATAAACAGCT | GCTGTGAAGG | 360 |
| AAGGAAAAGT | TGAATAAGGA | GTGGGCTTA | AATTTAAAAA | AAGGAAAAR | GAAAATTGAG | 420 |
| GTGTTAGGRT | TTTCATGGGT | AACAAGCTCT | GGGTATTARG | CTAAGGCTGG | GCAAGTTCA | 480 |
| GGWTACTAAA | ATATTATTTG | ATCATATCTT | GGATCCNTAT | YYTGRRRAAT | TTAAAAA | 536 |

(2) INFORMATION FOR SEQ ID NO:18:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 93 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:18:

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Arg | Ala | Glu | Leu | Lys | Ile | Ala | Val | Val | Leu | Phe | Ala | Phe | His |
| 1 | | | | | | | | | | | | | | | 15 |
| Leu | Leu | Leu | Ser | Phe | Ile | Leu | Gly | Ser | Leu | Leu | Ser | Ile | Asn | Ser | Cys |
| | | | | | | | | | | | | | | | 30 |
| Cys | Glu | Gly | Arg | Lys | Ser | Xaa | Ile | Arg | Ser | Trp | Ala | Xaa | Ile | Leu | Lys |
| | | | | | | | | | | | | | | | 45 |
| Lys | Glu | Lys | Xaa | Lys | Leu | Arg | Phe | Xaa | Xaa | Phe | His | Gly | Xaa | Gln | Ala |
| | | | | | | | | | | | | | | | 60 |
| Leu | Gly | Ile | Xaa | Leu | Arg | Leu | Gly | Lys | Phe | Gln | Xaa | Thr | Lys | Ile | Leu |
| | | | | | | | | | | | | | | | 80 |
| Phe | Asp | His | Ile | Leu | Asp | Pro | Tyr | Xaa | Xaa | Lys | Phe | Lys | | | |
| | | | | | | | | | | | | | | | |

85

90

(2) INFORMATION FOR SEQ ID NO:19:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 397 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:19:

| | |
|--|-----|
| AAGGTAAATT AGAAAATAAGT ATGAATATTA ATAAAATAGC ATTTATCTTA TTTCTCTATT | 60 |
| TTATGTTGTG ACTTAACCTA ATTTTATTTT TTTAACATTT TCTTATTTCT TATAATATGA | 120 |
| ATGCTGATAT TTAAAGGTAG ATCTATGTGG TATTCTTG GTTTCTNAAT TGTATAGCTC | 180 |
| TTAAGATTAT TTGTGATCTG GATTTATGTA TTTGTTAGAT ACATACGAAT TGTTAAAATG | 240 |
| GAATGCAAGT TTTTCAAAAG CCCAGGTCTA AATGTAATGG TTGGTTTATT GTTCTATAAC | 300 |
| CCCAGCCCAT CATTTCCTGT GTAAATCATA AACAAATAAAC AGAATATACT CGGTGGTCAT | 360 |
| TTCTAAAAAA AAAAAAAA AAAATTNCCTG CGGCCGC | 397 |

(2) INFORMATION FOR SEQ ID NO:20:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 476 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:20:

| | |
|--|-----|
| GAATTCCGCA CNAGCAGTGA AGCGCAGTGA CAGCAGTGGG AACCGGAATA TCCAAAGAGT | 60 |
| GGTTTGAAAGG AGAAAGAACG ATTGTGGCTT TATATCCTCT GGGCCTGGGT TTCCTGAAGT | 120 |
| CACCACACAT AGAGGAGAGA GAAAATGGCT GAGTTAAAGT ACATTTCTGG ATTTGGGAAT | 180 |
| GAGTGTCTT CAGAGGATCC TCGCTGCCA GGTCCTCTGC CAGAAGGACA GAATAATCCT | 240 |
| CAGGTCTGCC CCTACAATCT CTATGCTGAG CAGCTCTCAG GATCGGCTTT CACTTGTCCA | 300 |
| CGGAGCACCA ATAANGAGAA GCTGGCTGTA TAGGATTCTA CCTTCAGTTT YTCAACAAGCC | 360 |
| CTTTGGAATC CATTGACGA NGGCCAYGTT CACTCACAAAC TGGGNATGG AAGTTGATCC | 420 |
| TGATCCTAAC CAGNTTAGAT GGNAAAACCAT TTTTGAGGTT TCCAAAAGGC ATNTTC | 476 |

(2) INFORMATION FOR SEQ ID NO:21:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 99 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:21:

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Ser | Val | Leu | Gln | Arg | Ile | Leu | Ala | Ala | Gln | Val | Pro | Cys | Gln | Lys |
| 1 | | | | | | 5 | | | | | 10 | | | | 15 |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Asp | Arg | Ile | Ile | Leu | Arg | Ser | Ala | Pro | Thr | Ile | Ser | Met | Leu | Ser | Ser |
| | | | | | | | | | 20 | 25 | | | | 30 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Gln | Asp | Arg | Leu | Ser | Leu | Val | His | Gly | Ala | Pro | Ile | Xaa | Arg | Ser |
| | | | | | | | | 35 | 40 | | | | 45 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Trp | Leu | Tyr | Arg | Ile | Leu | Pro | Ser | Val | Xaa | His | Lys | Pro | Phe | Gly | Ile |
| | | | | | | | | 50 | 55 | | | | 60 | | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| His | Leu | Thr | Xaa | Ala | Xaa | Phe | Thr | His | Asn | Trp | Gly | Met | Glu | Val | Asp |
| | | | | | | | | 65 | 70 | | | | 75 | 80 | |

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Pro | Asp | Pro | Asn | Gln | Xaa | Arg | Trp | Xaa | Thr | Ile | Phe | Glu | Val | Ser | Lys |
| | | | | | | | | 85 | 90 | | | | 95 | | |

Arg His Xaa

(2) INFORMATION FOR SEQ ID NO:22:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 49 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:22:

| | | | | | | | |
|------------|-------|-------|-------|-------|-------|-----------|----|
| GGGGAAAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAAAA | AAACTCGAG | 49 |
|------------|-------|-------|-------|-------|-------|-----------|----|

(2) INFORMATION FOR SEQ ID NO:23:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 612 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:23:

| | |
|---|-----|
| AAGCTTGGCA CGAGGCAGGG AAGGTCTGA CCCCANCGAG CACTTCTGAC AATGAGACCA | 60 |
| GAGACTCCWC AATTATTGAT CCAGGAAC TG AGCAAGATCT TCCTTCCCCT GAAAATAGTT | 120 |
| CTGTTAAAGA ATACCGAATG GAAGTCCAT CTTCGTTTC AGAAGACATG TCAAATATCA | 180 |
| GGTCACAGCA TGCAAGAGAA CAGTCCAACA ATGGTAGATA TGACGATTGT AAAGAATTAA | 240 |
| AAGACCTCCA CTGTTCCAAG GATTMTACCC TAGCCGAGGA AGAATCTGAG TTCCCTTCTA | 300 |
| CTTCTATCTC TGCAGTTCTG TCTGACTTAG CTGACTTGAG AAGCTGTGAT GGCCAAGCTT | 360 |
| TGCCCTCCCA GGGACCCTGA GGTTGCTTTA TCTCTCAGTT GTGCCCATTC CAGAGGACTC | 420 |
| TTTAGTCATA TGCAAGCAACA TGACATTTTA GGATACCCCTG TGTTAGGGAC CATTGAATCT | 480 |
| ACAATCCATG TTCGTTACAA AGGGATATCT GGGCAAAGGG AAACCAAGCT GCTTCTTGA | 540 |
| ACATTAGGGN GTTAGGCATT GTCTTACTTT TTAAAGTCCC TCACCCCCAA CCCCCATGCT | 600 |
| GTCCCCATGCTA AG | 612 |

(2) INFORMATION FOR SEQ ID NO:24:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 131 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:24:

| | | | |
|---|-----|-----|----|
| Met Thr Ile Val Lys Asn Leu Lys Thr Ser Thr Val Pro Arg Ile Xaa | | | |
| 1 | 5 | 10 | 15 |
| Pro Xaa Pro Arg Lys Asn Leu Ser Ser Leu Leu Leu Ser Leu Gln | | | |
| 20 | 25 | 30 | |
| Phe Cys Leu Thr Xaa Leu Thr Xaa Glu Ala Val Met Ala Lys Leu Cys | | | |
| 35 | 40 | 45 | |
| Pro Pro Arg Asp Pro Glu Val Ala Leu Ser Leu Ser Cys Gly His Ser | | | |
| 50 | 55 | 60 | |
| Arg Gly Leu Phe Ser His Met Gln Gln His Asp Ile Leu Gly Tyr Pro | | | |
| 65 | 70 | 75 | 80 |
| Val Leu Gly Thr Ile Glu Ser Thr Ile His Val Arg Ser Gln Gly Ile | | | |
| 85 | 90 | 95 | |
| Ser Gly Gln Arg Glu Thr Lys Leu Leu Xaa Thr Leu Gly Xaa Xaa | | | |
| 100 | 105 | 110 | |

Ala Leu Ser Tyr Phe Leu Lys Ser Leu Thr Pro Asn Pro His Ala Val
115 120 125

Leu Tyr Lys
130

(2) INFORMATION FOR SEQ ID NO:25:

- (i) SEQUENCE CHARACTERISTICS:

 - (A) LENGTH: 69 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:25:

TTTTTAAAAA AAAAAAAA AAAAAAAA AAAAAAAA AAAAAAAA AAATTNTCNC 60
TGCGGCCGC 69

(2) INFORMATION FOR SEQ ID NO:26:

- (i) SEQUENCE CHARACTERISTICS:

 - (A) LENGTH: 655 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:26:

| | | | | | | |
|--------------|-------------|------------|------------|-------------|-------------|-----|
| CAATNATAAA | ATGTCAGCTT | TTAAGGNANN | CCTGTGGAAT | ATATTTCCA | GCAATAAAAA | 60 |
| GAGATCCAGG | CAGATATTAA | CATAGTTGTC | CCTGAATCTG | TGAAAAAAATG | GCTTCGACAG | 120 |
| CTAAAGAACATG | CTGGGAAAAT | TCTTCTGTTA | ATNACCAGTT | CTCACACTGA | TTACTGTAGA | 180 |
| CTTCTCTGCG | AATATATTCT | TGGGAATGAT | TTTACAGACC | TTTTTGACAT | TGTGATTACA | 240 |
| AATGCATTGA | AGCCTGGTTT | CTTCTCCCAC | TTACCAAGTC | AGAGACCTTT | CCGGACACTC | 300 |
| GAGAATGATG | AGGAGCGAGGA | GGCACTGCCA | TCTCTGGATA | AACCTGGCTG | GTACTCCCAA | 360 |
| GGGAACGCTG | TCCACCTCTA | TGAACCTCTG | AAGAAAATGA | CTGGCAAACC | TGAACCCAAAG | 420 |
| GTTSTTTATT | NWTGGTGWCA | GCATGCAWTC | AGATATTTTC | CCAGCTCGTC | ACTATAGTAA | 480 |
| TTGGGGAGAC | AGTCCTCATC | CGKGGAAGGA | ACTCAGAGGG | GGATGAARGG | GCACGAGGGA | 540 |
| GTTCAAGAGGC | CTTGAGGGAG | TTCAGAGCCT | CTTAGAAGAA | GGAAAGGGAA | ATTTTGAGGG | 600 |
| GACCAAAAGN | CAAAACCTTT | AATTATTC | TTTAAANAT | GGGGTTTTT | TTTTN | 655 |

(2) INFORMATION FOR SEQ ID NO:27:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 199 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:27:

```

Lys Glu Ile Gln Ala Asp Ile Tyr Ile Val Val Pro Glu Ser Val Lys
1           5           10          15

Lys Trp Leu Arg Gln Leu Lys Asn Ala Gly Lys Ile Leu Leu Xaa
20          25           30

Thr Ser Ser His Ser Asp Tyr Cys Arg Leu Leu Cys Glu Tyr Ile Leu
35          40           45

Gly Asn Asp Phe Thr Asp Leu Phe Asp Ile Val Ile Thr Asn Ala Leu
50           55           60

Lys Pro Gly Phe Phe Ser His Leu Pro Ser Gln Arg Pro Phe Arg Thr
65           70           75           80

Leu Glu Asn Asp Glu Glu Gln Ala Leu Pro Ser Leu Asp Lys Pro
85           90           95

Gly Trp Tyr Ser Gln Gly Asn Ala Val His Leu Tyr Glu Leu Leu Lys
100          105          110

Lys Met Thr Gly Lys Pro Glu Pro Lys Val Xaa Tyr Xaa Trp Xaa Gln
115          120          125

His Ala Xaa Arg Tyr Phe Pro Ser Ser Leu Xaa Xaa Leu Gly Arg
130          135          140

Gln Ser Ser Ser Xaa Glu Gly Thr Gln Arg Gly Met Lys Gly His Glu
145          150          155          160

Gly Val Gln Arg Pro Xaa Gly Ser Ser Glu Pro Leu Arg Arg Arg Lys
165          170          175

Gly Lys Phe Xaa Gly Asp Gln Lys Xaa Lys Pro Leu Ile Ile Ser Phe
180          185          190

Xaa Xaa Trp Gly Phe Phe Phe
195

```

(2) INFORMATION FOR SEQ ID NO:28:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 279 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:28:

| | |
|--|-----|
| TCCTCCACTG NTCTTATCAA GTGATGAGAC ACTGATATCC AAATAANTNG TATTTACTGA | 60 |
| AAAATGAAGT GAAGACCCAT ATATGCAGTT AAAAAAAAGT TAATTTCAA AAAATACTGT | 120 |
| AAAAGACTTT AAGGAACAAG TTTTATTGAC CAATAAGTTG ATATTTGTCC ATAGGTCTCC | 180 |
| TTTCTATAAA TCATCTTGAT GTTTAACAAAC TCTTATTATA TTAAAATCTC AGTATCCTAA | 240 |
| AACTTAAAAA AAAAAAAA AAAAACATGT TTAATTAAK | 279 |

(2) INFORMATION FOR SEQ ID NO:29:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 391 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:29:

| | |
|--|-----|
| GAACNTGGGC CGCATGTATN TCTTCTATGG CAACAAGACC TCGGTGCAGT TCCAGAATT | 60 |
| CTCACCCACT GTGGTTCAACC CGGGAGACCT CCAGACTCAG CTGGCTGTGC AGACCAAGCG | 120 |
| CGTGGCGGCG CAGGTGGACG GCGGCGCGCA GGTCAGCAGC GTGCTCAATA TCGAGTGCT | 180 |
| GCGGGACTTC CTGACGCCCG CGCTGCTGTC CGTGCCTTC CGGTACGGTG GCGCCCCCCA | 240 |
| GGCCCTCACCT CTGAAGCTCC CAGTGACCAT CAACAAGTTC TTCCAGCCCA CCGAGATGGC | 300 |
| GGCCCAGGAT TTCTTCCAGC GCTGGAAGCA GCTGANCTC CCTCAACAGG AGGCGCAGAA | 360 |
| AATCTTCAAA GCCAACCAACC CCATGGACGC A | 391 |

(2) INFORMATION FOR SEQ ID NO:30:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 126 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:30:

| | | | |
|---|---|----|----|
| Met Tyr Xaa Phe Tyr Gly Asn Lys Thr Ser Val Gln Phe Gln Asn Phe | | | |
| 1 | 5 | 10 | 15 |
| Ser Pro Thr Val Val His Pro Gly Asp Leu Gln Thr Gln Leu Ala Val | | | |

| | | |
|---|-----|-----|
| 20 | 25 | 30 |
| Gln Thr Lys Arg Val Ala Ala Gln Val Asp Gly Gly Ala Gln Val Gln | | |
| 35 | 40 | 45 |
| Gln Val Leu Asn Ile Glu Cys Leu Arg Asp Phe Leu Thr Pro Pro Leu | | |
| 50 | 55 | 60 |
| Leu Ser Val Arg Phe Arg Tyr Gly Gly Ala Pro Gln Ala Leu Thr Leu | | |
| 65 | 70 | 75 |
| Lys Leu Pro Val Thr Ile Asn Lys Phe Phe Gln Pro Thr Glu Met Ala | | |
| 85 | 90 | 95 |
| Ala Gln Asp Phe Phe Gln Arg Trp Lys Gln Leu Xaa Leu Pro Gln Gln | | |
| 100 | 105 | 110 |
| Glu Ala Gln Lys Ile Phe Lys Ala Asn His Pro Met Asp Ala | | |
| 115 | 120 | 125 |

(2) INFORMATION FOR SEQ ID NO:31:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 197 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:31:

| | |
|--|-----|
| CCCTCTNTCC NTTTCCCCCC CAAGCACAGA GGGGAGAGGG GCCAGGGAAAG TGGATGTTTC | 60 |
| TTCCCNNTCCC ACCCCACCCCT GTTGAGCCCC CTCTTACCCCC CTCCCCATCC AGGGGCTGTG | 120 |
| TATTATTGTG AGCGNATAAA CAGAGAGACG CTAAAAAAAAA AAAAAAAAAA AAAAAAAATCC | 180 |
| NNTAATTAAG CGGCCGC | 197 |

(2) INFORMATION FOR SEQ ID NO:32:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 514 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:32:

| | |
|---|-----|
| AAGCTTGGCA CGTGGCTGAT TGGAGCTGTA AAACATCATC AGGTGTTGCT ATTWTTTTAT | 60 |
| ATGATTATTC TGTTACTTGT ATTTATTGTT CAGTTTCTG TATCTTGCGC TTGTTTAGCC | 120 |
| CTGAACCAGG AGCAACAGGG TCAGCTTCTG GAGGTTGGTT GGAACAATAC GGCAAGTGCT | 180 |

| | |
|---|-----|
| CGAAATGACA TCCAGAGAAA TCTAAACTGC TGTGGTTCC GAAAGTGTAA CCCAAATGAC | 240 |
| ACCTGTCTGG CTAGCTGTGT TAAAAGTGAC CACTCGTGCT CGCCATGTGC TCCAATCATA | 300 |
| GGAGAATATG CTGGAGAGGT TTTGAGATTT GTTGGTGGCA TTGGCCTGTT CTTCAGTTTT | 360 |
| ACAGAGATCC TGGGGTGTGTT GGCTGACCTA CAGATACAGG AACCAGAAAG ACCCCCAGCGC | 420 |
| GAATCCTAGT GCATTCCTTT GGATGAGGAA ACAAAGGGAA GNTTCCNNTT CGTATTATGG | 480 |
| NCTTGTGTTCA CTTTCTGTAA TTTTCTGTGTT AAGG | 514 |

(2) INFORMATION FOR SEQ ID NO:33:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 151 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:33:

| | | | |
|---|-----|-----|----|
| Met Ile Ile Leu Leu Leu Val Phe Ile Val Gln Phe Ser Val Ser Cys | | | |
| 1 | 5 | 10 | 15 |
| Ala Cys Leu Ala Leu Asn Gln Glu Gln Gln Gly Gln Leu Leu Glu Val | | | |
| 20 | 25 | 30 | |
| Gly Trp Asn Asn Thr Ala Ser Ala Arg Asn Asp Ile Gln Arg Asn Leu | | | |
| 35 | 40 | 45 | |
| Asn Cys Cys Gly Phe Arg Ser Val Asn Pro Asn Asp Thr Cys Leu Ala | | | |
| 50 | 55 | 60 | |
| Ser Cys Val Lys Ser Asp His Ser Cys Ser Pro Cys Ala Pro Ile Ile | | | |
| 65 | 70 | 75 | 80 |
| Gly Glu Tyr Ala Gly Glu Val Leu Arg Phe Val Gly Gly Ile Gly Leu | | | |
| 85 | 90 | 95 | |
| Phe Phe Ser Phe Thr Glu Ile Leu Gly Cys Leu Ala Asp Leu Gln Ile | | | |
| 100 | 105 | 110 | |
| Gln Glu Pro Glu Arg Pro Pro Arg Glu Ser Xaa Cys Ile Pro Leu Asp | | | |
| 115 | 120 | 125 | |
| Glu Glu Asn Lys Gly Xaa Phe Xaa Phe Val Leu Trp Xaa Cys Phe Thr | | | |
| 130 | 135 | 140 | |
| Phe Cys Asn Phe Ser Val Lys | | | |
| 145 | 150 | | |

(2) INFORMATION FOR SEQ ID NO:34:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 218 base pairs
 - (B) TYPE: nucleic acid

(C) STRANDEDNESS: double
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:34:

| | |
|---|-----|
| ACGTAGCAAA AAGATATTTG ATTATCTTAA AAATTGTTAA ATACCGTTT CANGAAAGTT | 60 |
| CTCAGTATTG TAACAGCAAC TTGTCAAACC TAAGCATATT TGAATNTGAT NTCCCATAAT | 120 |
| TTGAAATNGA AATCGTATGG TGTGGCTCG TATATTCTGT TAAAAAAATTA AGGGACCAGA | 180 |
| AACCTTAAAA AAAAAAAA AAAATCCCT GCGGCCGC | 218 |

(2) INFORMATION FOR SEQ ID NO:35:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 525 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: double
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:35:

| | |
|--|-----|
| CAAGATTGGC AAGATGCTTA TTTNTGNNNC CATATTTGGC TGCCTTGACC CAGTGGCAAC | 60 |
| ACTAGCTGCA GTTATGACAG AGAAGTCTCC TTTTACCAACA CCAATTGGTC GAAAAGATGA | 120 |
| AGCAGATCTT GCAAAATCAG CTTTGGCCAT GGCGGATTCA GACCACCTGA CGATCTACAA | 180 |
| TGCATATCTA CGATGAAAG AAAGCACGAC AAGAAGGAGG TTATCGTTCT GAAATCACAT | 240 |
| ACTGCCGGAG GNAACTTTCT TAATANAACA TCACTGTTAA CCCTAGAGGA TGTAAAGCAG | 300 |
| GAGTTAATAA AGTGGTTAA GGCAGCAGGA TTTCATCTT CCACAACCTTC TACCAAGCTGG | 360 |
| GAAGGAAACA GANCCTCACA GACCCTCTCA TTCCAAGAAA TTGCCCTCT TAAANCTGTA | 420 |
| CTGGTGGCTG GACTGTATGA CAATGTNGGG AAAATAATCT ATACAAATCN NTGGATGTTA | 480 |
| CANAAAAATT GGCTTGCATT GTGGANACGG CCCAGGCNAACACAA | 525 |

(2) INFORMATION FOR SEQ ID NO:36:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 111 amino acids
 (B) TYPE: amino acid
 (C) STRANDEDNESS:
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:36:

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Glu | Arg | Lys | His | Asp | Lys | Glu | Val | Ile | Val | Leu | Lys | Ser | His | |
| 1 | | | | | 5 | | | | 10 | | | | 15 | | |
| Thr | Ala | Gly | Gly | Asn | Phe | Leu | Asn | Xaa | Thr | Ser | Leu | Leu | Thr | Leu | Glu |
| | | | | | 20 | | | | 25 | | | | 30 | | |
| Asp | Val | Lys | Gln | Glu | Leu | Ile | Lys | Leu | Val | Lys | Ala | Ala | Gly | Phe | Ser |
| | | | | | 35 | | | 40 | | | | 45 | | | |
| Ser | Ser | Thr | Thr | Ser | Thr | Ser | Trp | Glu | Gly | Asn | Arg | Xaa | Ser | Gln | Thr |
| | | | | | 50 | | | 55 | | | | 60 | | | |
| Leu | Ser | Phe | Gln | Glu | Ile | Ala | Leu | Leu | Lys | Xaa | Val | Leu | Val | Ala | Gly |
| | | | | | 65 | | | 70 | | | 75 | | | 80 | |
| Leu | Tyr | Asp | Asn | Val | Gly | Lys | Ile | Ile | Tyr | Thr | Asn | Xaa | Trp | Met | Leu |
| | | | | | 85 | | | 90 | | | | 95 | | | |
| Xaa | Lys | Asn | Trp | Leu | Ala | Leu | Trp | Xaa | Arg | Pro | Arg | Xaa | Asn | Thr | |
| | | | | | 100 | | | 105 | | | | 110 | | | |

(2) INFORMATION FOR SEQ ID NO:37:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 109 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:37:

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| ACATGTATAA | TTTTNTAGTT | TCCTTTTAA | TGATGATTAT | TCTGAATGTA | TTTGCCANTA | 60 |
| CANNTACAAT | AAATTTNTTT | GGTATTATGC | AAAAAAAAAA | AAAAAAAAAA | | 109 |

(2) INFORMATION FOR SEQ ID NO:38:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 825 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:38:

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| GAATTCGGCA | CGAGTTTTT | TTTCTGCAG | TTGTGTGTAT | GTGTGTTGT | GTGAAGAAAA | 60 |
| ACAGACTCTG | TCCAGGTAGA | AATGGTGAGG | AGGGGAAAGA | GAATTACATT | TCCAGGGTCA | 120 |
| GAAACTTGGC | AACAGTTTC | CTAKAGTGAC | TCAGACACAC | CACAGTAACA | ACTCTCGCTG | 180 |

| | |
|---|-----|
| CAATTTTATT TTAATTTGAG AAATAAAGAT TTCCTCCAAG CCACATGAGG ACTCTGGCAC | 240 |
| CCACCCACAA AGCAAGACCT GTATTTATAA GCCGAGGGTG CAGGGAGCTN AACTGCGGGA | 300 |
| CCCCGTCAAGG CCCCGTGGAC CCATCCCCGT CCCCACCCCC CCCTCCACCG YTGGGGCCA | 360 |
| TCAGTGTGTG TTGGGGGGGA TGCTTGGCA GCTGGGGGT GAGGGAGACA ACAAACCTYG | 420 |
| GGGAAYGGG AGCCAGAGCT GCGGCCTGAC TGACGCCTT TGATGCTAC GGGAAATTN | 480 |
| TGCCCAGGAT NTCAGCCCCA GGCTGGTTGT TTCTACAAAT CTCTCTCAA TGTATTATTT | 540 |
| TGGTGACAAA AATGAAGGAG CTTTGTAAAT TTTTTAAAAA TTATGAATNC ATATCAAGTA | 600 |
| GTTGTTTACA TTTCTTGAAA AAATAGGAAC TCGGGCAGCA GAATCAGATT GGCAGAACT | 660 |
| TTAGACTACA CAGGCAATAA TCAAGTCTGC TGTTTGNC TTTCTGTAGTA GAAGTGGTTG | 720 |
| TAGTGTAG ATATCTGTTT GGTCTTGCTT CTTGTATTGC ATTTTTTCA ATAAACAACA | 780 |
| ACAAAAAGAA AAAAAGAAA AAAAAGAAA AAGATTTA ATTAA | 825 |

(2) INFORMATION FOR SEQ ID NO:39:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 200 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:39:

| | | | |
|---|-----|-----|----|
| Met Arg Thr Leu Ala Pro Thr His Lys Ala Arg Pro Val Phe Ile Ser | | | |
| 1 | 5 | 10 | 15 |
| Arg Gly Cys Arg Glu Leu Asn Cys Gly Thr Arg Gln Gly Pro Val Asp | | | |
| 20 | 25 | 30 | |
| Pro Ser Pro Ser Pro Pro Pro Pro Pro Leu Gly Pro Ile Ser Val | | | |
| 35 | 40 | 45 | |
| Cys Trp Gly Gly Cys Leu Gly Ser Trp Gly Val Arg Glu Thr Thr Asn | | | |
| 50 | 55 | 60 | |
| Leu Gly Glu Leu Gly Ala Arg Ala Ala Xaa Leu Thr Pro Phe Asp | | | |
| 65 | 70 | 75 | 80 |
| Ala His Gly Lys Phe Xaa Pro Arg Xaa Ser Ala Pro Gly Trp Leu Phe | | | |
| 85 | 90 | 95 | |
| Leu Gln Ile Ser Leu Lys Cys Ile Ile Leu Val Thr Lys Met Lys Glu | | | |
| 100 | 105 | 110 | |
| Leu Cys Lys Phe Phe Xaa Asn Tyr Glu Xaa Ile Ser Ser Ser Cys Leu | | | |
| 115 | 120 | 125 | |
| His Phe Leu Lys Xaa Glu Leu Gly Gln Gln Asn Gln Ile Gly Arg | | | |

| | | |
|---|-----|-----|
| 130 | 135 | 140 |
| Ile Phe Arg Leu His Arg Gln Xaa Ser Ser Leu Leu Phe Xaa Pro Phe | | |
| 145 | 150 | 155 |
| Val Val Glu Val Val Val Phe Arg Tyr Leu Phe Gly Leu Ala Ser | | |
| 165 | 170 | 175 |
| Cys Ile Ala Phe Phe Ser Ile Asn Asn Asn Lys Lys Lys Lys Lys Lys | | |
| 180 | 185 | 190 |
| Lys Lys Lys Lys Asp Leu Xaa Leu | | |
| 195 | 200 | |

(2) INFORMATION FOR SEQ ID NO:40:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 508 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:40:

| | |
|--|-----|
| AAGCTTGCGCA CGNGGTCTGT CGCTCCCGGA AACMTGTTGG CAATGCCTAT TTTTTGGCTT | 60 |
| TCCCCCGCGT TCTCTAAACT AACTATTTAA AGGTCTGCGG TCCCSAAATG GTTGACTAA | 120 |
| ACGTAGGATG GGACTTAAGT TGAACGGCAG ATATATTCA CTGATCCTCG CGGTGCAAAT | 180 |
| AGCGTATCTG GTGCAGGCCG TGAGAGCAGC GGGCAAGTGC GATGCGGTCT TCAAGGGCTT | 240 |
| TTCGGACTGT TTGCTCAAGC TGGCGAMMR CATGGCCAA CTACCCGCAG GSCTKGGACG | 300 |
| ACAAGACGAA CATCAAGACC GTGTGCACAT ACTGGGAGGA TTTCCACAGC TGCACGGTCA | 360 |
| CAGCCCTTAC GGATTGCCAG GGAAGGGCG AAAGATATGT GGGGATAAAC TGAGAAAAGA | 420 |
| ATCCAAAAAC CTCAACATCC AAGGGCAGCT TATTTCGAAY TYTGGCCAN GTCAACGGNG | 480 |
| GCGGCCGGGT CCTTGTCCCC GGCTTTTT | 508 |

(2) INFORMATION FOR SEQ ID NO:41:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 127 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:41:

Met Gly Leu Lys Leu Asn Gly Arg Tyr Ile Ser Leu Ile Leu Ala Val
 1 5 10 15

 Gln Ile Ala Tyr Leu Val Gln Ala Val Arg Ala Ala Gly Lys Cys Asp
 20 25 30

 Ala Val Phe Lys Gly Phe Ser Asp Cys Leu Leu Lys Leu Gly Xaa Xaa
 35 40 45

 Met Gly Gln Leu Pro Ala Gly Leu Gly Arg Gln Asp Glu His Gln Asp
 50 55 60

 Arg Val His Ile Leu Gly Gly Phe Pro Gln Leu His Gly His Ser Pro
 65 70 75 80

 Tyr Gly Leu Pro Gly Lys Gly Arg Lys Ile Cys Gly Asp Lys Leu Arg
 85 90 95

 Lys Glu Ser Lys Asn Leu Asn Ile Gln Gly Gln Leu Ile Ser Asn Xaa
 100 105 110

 Ala Ala Xaa Gln Arg Xaa Arg Pro Gly Pro Cys Ser Arg Leu Phe
 115 120 125

(2) INFORMATION FOR SEQ ID NO:42:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 269 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:42:

| | |
|---|-----|
| TGGTTTTAGC TCTTACACAC ACAGTAATAC CTGAATATCC CACGGTATAG ATCACANGGG | 60 |
| GGGGATGTTA AATGTTAAC TAAAATATAG CTAAAAAAAG ATTTTGACAT AAAAGAGCCT | 120 |
| TGATTTAAA AAAAAAAGAG AGAGAGATGT AATTAAAAAA GTTTATTATA ATTAAATTC | 180 |
| AGCNAAAAAA GATTTGCTAC AAAGTATAGA GAAGTATAAA ATAAAAGTTA TTGTTTGNA | 240 |
| AAAAAAAAAAA AAAAATTNCC TGC GGCCCG | 269 |

(2) INFORMATION FOR SEQ ID NO:43:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 676 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:43:

| | | | | | | |
|------------|-------------|------------|------------|------------|------------|-----|
| GAGATTTCA | GCACCCCTGCG | ATATGCAAGC | CGAGNTCAGC | GGGTACCCAC | CCGACCACAG | 60 |
| GCCCCCAAGT | TTCCTGTGGC | AAAGCAGCCC | CAGCGTTGG | AGACAGAGAT | GCTGCAGCTC | 120 |
| CAGGAGGAGA | ACCGTCGCCT | GCAGTTCCAG | NTGGACCAA | TGGANTGCAA | GGCCTCAGGG | 180 |
| TTCAGTGGAG | CCCGGGTGGC | CTGGGCCAG | CGGAACCTGT | ACGGGATGNT | ACAGGAGTT | 240 |
| CATGNTAGAG | AATGAGAGGC | TCAGGAAAGA | AAAGAGCCAG | CTGCAGAATA | GCCGAGAGCT | 300 |
| AGCCCAGAAC | GAGCACCGCA | TCCTGGCCA | GCAGGTCCAT | GCACTAGAGA | RGCCTCCT | 360 |
| CTCTGCCTGC | TACCATCACC | AGCAGGGTCC | TGGCCTGACC | CCACCGTGTC | CCTGCTTGAT | 420 |
| GGCCCCAGCT | CCCCCTTGCC | ATGCACTGCC | ACCCCTCTAC | TCCTGCCCT | GCTGCCACAT | 480 |
| CTGCCCACGT | TGTCKAGTGC | CCCTGGCCA | CTGGGYYKGC | CTGSCMAGGG | GAGCACCACC | 540 |
| TTGCCCCAGC | CTCTCTTCTG | GGGCTCTGAR | GAGTCAGAAA | TAGACCAGAC | GTGGTTCCCT | 600 |
| GGTTCTCAGG | ANGGTTTTA | GTTTNAGGAG | AGGGACGGTA | GAAGAACCAT | TTTGTGCAA | 660 |
| AAAGAAGGGG | ACCAAG | | | | | 676 |

(2) INFORMATION FOR SEQ ID NO:44:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 218 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:44:

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Gln | Ala | Glu | Xaa | Ser | Gly | Ser | Pro | Pro | Asp | His | Arg | Pro | Pro | Ser |
| 1 | | | | | | | | | | | | | | | 15 |
| Phe | Leu | Trp | Gln | Ser | Ser | Pro | Ser | Val | Trp | Arg | Gln | Arg | Cys | Cys | Ser |
| | | | | | | | | | | | | | | | 20 |
| | | | | | | | | | | | | | | | 25 |
| | | | | | | | | | | | | | | | 30 |
| Ser | Arg | Arg | Arg | Thr | Val | Ala | Cys | Ser | Ser | Xaa | Trp | Thr | Lys | Trp | Xaa |
| | | | | | | | | | | | | | | | 35 |
| | | | | | | | | | | | | | | | 40 |
| | | | | | | | | | | | | | | | 45 |
| Ala | Arg | Pro | Gln | Gly | Ser | Val | Glu | Pro | Gly | Trp | Pro | Gly | Pro | Ser | Gly |
| | | | | | | | | | | | | | | | 50 |
| | | | | | | | | | | | | | | | 55 |
| Thr | Cys | Thr | Gly | Xaa | Tyr | Arg | Ser | Phe | Met | Xaa | Glu | Asn | Glu | Arg | Leu |
| | | | | | | | | | | | | | | | 65 |
| | | | | | | | | | | | | | | | 70 |
| | | | | | | | | | | | | | | | 75 |
| | | | | | | | | | | | | | | | 80 |
| Arg | Lys | Glu | Lys | Ser | Gln | Leu | Gln | Asn | Ser | Arg | Glu | Leu | Ala | Gln | Asn |
| | | | | | | | | | | | | | | | 85 |
| | | | | | | | | | | | | | | | 90 |
| | | | | | | | | | | | | | | | 95 |
| Glu | Gln | Arg | Ile | Leu | Ala | Gln | Gln | Val | His | Ala | Leu | Glu | Xaa | Arg | Leu |
| | | | | | | | | | | | | | | | 100 |
| | | | | | | | | | | | | | | | 105 |
| | | | | | | | | | | | | | | | 110 |

Leu Ser Ala Cys Tyr His His Gln Gln Gly Pro Gly Leu Thr Pro Pro
 115 120 125
 Cys Pro Cys Leu Met Ala Pro Ala Pro Pro Cys His Ala Leu Pro Pro
 130 135 140
 Leu Tyr Ser Cys Pro Cys Cys His Ile Cys Pro Leu Cys Xaa Val Pro
 145 150 155 160
 Leu Ala His Trp Xaa Xaa Leu Xaa Arg Gly Ala Pro Pro Cys Pro Ser
 165 170 175
 Leu Ser Ser Gly Ala Leu Xaa Ser Gln Lys Xaa Thr Arg Arg Gly Phe
 180 185 190
 Leu Val Leu Arg Xaa Val Phe Ser Xaa Arg Arg Gly Thr Val Glu Glu
 195 200 205
 Pro Phe Cys Cys Lys Lys Lys Gly Thr Lys
 210 215

(2) INFORMATION FOR SEQ ID NO:45:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 394 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:45:

| | |
|---|-----|
| TTCCAAACTT GGCCCAGAGA CTGGAGGCCT TCAGAGACCA GATTGGCAGN TCCNTGCGAN | 60 |
| GTGGCCGAG CCAGCCACCC TGCAGTGAGG GCGCACGGAG CNCAGGCCAA GTCNTCCNTC | 120 |
| CCCATTGAAG GCCAAGTGGG AACNNANNAG AATGCTGTGT GACCTCAGAC TGGGCTCCAC | 180 |
| ACTCTTGGGC TTCAGTCTGC CCATCTGCTG AATGGAGACA GCAGCTGNTA CTCCACCTGC | 240 |
| AGCTGGGCTA GGGGCGGGGA CTGGGGTGC TATTTAGGGG AACAAAGGGGA TTTCAGGAGA | 300 |
| AACCCAGGCA GCAGGGGATG AAATACATGA ATAAAGAGAG GCATCAGCTC CAAAAAAA | 360 |
| AAAAAAAAAA AAAGAACTTT AATTAAGCGG CGC | 394 |

(2) INFORMATION FOR SEQ ID NO:46:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 479 base pairs
 - (B) TYPE: nucleic acid
 - (C) STRANDEDNESS: double
 - (D) TOPOLOGY: linear

- (ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:46:

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| AAGCTTGGCA | CNAGGCCAA | ACCTCTATGG | ATATATAAAG | GGAAGCTTGA | GGAGGAATT | 60 |
| CACAGTTACA | GTGCAGAACG | AGAACAAAAA | GAATTAACCA | GCTCTTCAGT | CAAGCAAATC | 120 |
| CTCTACTCAC | CATGCTTCCT | CCTGCCATT | ATTCTATCT | CCTTCCCCTT | GCATGCATCC | 180 |
| TAATGAAAAG | CTGTTGGCT | TTTAAAAATG | ATGCCACAGA | AATCCTTTAT | TCACATGTGG | 240 |
| TTAAACCTGT | TCCAGCACAC | CCCAGCAGCA | ACAGCACGTT | GAATCAAGCC | AGAAATGGAG | 300 |
| GCAGGCATTT | CAGTAACACT | GGACTGGATC | GGAACACTCG | GGTCAAGTG | GGTTGCCGGG | 360 |
| AACTGCGTTC | CACCAAATAC | ATCTCTGGAT | GGGCCAGTTG | CACCAGCATT | CAGCCCTCTG | 420 |
| GAAGGGAGCT | GGGTGTGTGG | TGGCGAGTG | CTTGCCNT | GCCAGTGGTT | CCCTAACTG | 479 |

(2) INFORMATION FOR SEQ ID NO:47:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 116 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:47:

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Met | Leu | Pro | Pro | Ala | Ile | His | Phe | Tyr | Leu | Leu | Pro | Leu | Ala | Cys | Ile |
| 1 | | | | | | | | | | | | | | | 15 |
| Leu | Met | Lys | Ser | Cys | Leu | Ala | Phe | Lys | Asn | Asp | Ala | Thr | Glu | Ile | Leu |
| | 20 | | | | | | | 25 | | | | | 30 | | |
| Tyr | Ser | His | Val | Val | Lys | Pro | Val | Pro | Ala | His | Pro | Ser | Ser | Asn | Ser |
| | 35 | | | | | | | 40 | | | | | 45 | | |
| Thr | Leu | Asn | Gln | Ala | Arg | Asn | Gly | Gly | Arg | His | Phe | Ser | Asn | Thr | Gly |
| | 50 | | | | | | 55 | | | | | 60 | | | |
| Leu | Asp | Arg | Asn | Thr | Arg | Val | Gln | Val | Gly | Cys | Arg | Glu | Leu | Arg | Ser |
| | 65 | | | | | | 70 | | | 75 | | 80 | | | |
| Thr | Lys | Tyr | Ile | Ser | Gly | Trp | Ala | Ser | Cys | Thr | Ser | Ile | Gln | Pro | Ser |
| | | | | | | | | | | 85 | | 90 | | 95 | |
| Gly | Arg | Glu | Leu | Gly | Val | Trp | Trp | Ala | Ser | Ala | Leu | Pro | Xaa | Pro | Val |
| | | | | | | | | | | 100 | | 105 | | 110 | |
| Val | Pro | Xaa | Leu | | | | | | | | | | | | |
| | | | 115 | | | | | | | | | | | | |

(2) INFORMATION FOR SEQ ID NO:48:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 35 base pairs
- (B) TYPE: nucleic acid

- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:48:

AAGTTTAAAA AAAAAAAA AAATCNCGGC GCCGC

35

(2) INFORMATION FOR SEQ ID NO:49:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 296 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:49:

| | |
|---|-----|
| ACATTTACTT AAAGGAGAAA AGTAAGGGGG TCNCAGAAAT GTCTGGGCN ATTATAGAAA | 60 |
| ACATGAGTAC CAAGAAGCTC TGCATTGTTG GAGGGATTCT TCTGGTTTC CCAATCGTTG | 120 |
| CCTNTCTGGT GGGAGGCTTG ATCGCTCCAG CACCCACAAC ANCAGTACCC TACACGTCAA | 180 |
| TAAAATGTGT GGATGTCCGT AAGAACACC ACCAACAAAG ATGACTGGCT CCTTGGGAC | 240 |
| CTAACAAAGTG TTNCAGACC CATCNNTAG CGAACAAAC ANCCAGGCC AATGTA | 296 |

(2) INFORMATION FOR SEQ ID NO:50:

- (i) SEQUENCE CHARACTERISTICS:
- (A) LENGTH: 332 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:50:

| | |
|--|-----|
| GAATTCCGCA CGAGCTTGAT TGCTCCAGGG CCCACAACGG CAGTGTCTA CATGTCGGTG | 60 |
| AAATGTGTGG ATGCCGTAA GAACCACAC AAGACAAAAT GGTCGTGCC TTGGGGACCC | 120 |
| AATCATTGTG ACAAGATCCG AGACATTGAA GAGGAATTG CAAGGGAAAT TGAAGCCAAT | 180 |
| GACATCGTGT TTTCTGTTCA CATTCCCCTC CCCCCACATGG GAGATGAGTC CTTGGTTCCA | 240 |
| ATTCATGTTG TTTATCCTGG CAGCTGGGAC ATTGCCTTTC AAGCTAAACA ACCAAATCAG | 300 |

GGGAAAATGC AGGAAGTCTC CATGGGACGT TT

332

(2) INFORMATION FOR SEQ ID NO:51:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 110 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:51:

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Glu | Phe | Gly | Thr | Ser | Leu | Ile | Ala | Pro | Gly | Pro | Thr | Thr | Ala | Val | Ser |
| 1 | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| | 5 | | | | | | | | | | | | | | 15 |
|--|---|--|--|--|--|--|--|--|--|--|--|--|--|--|----|

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Tyr | Met | Ser | Val | Lys | Cys | Val | Asp | Ala | Arg | Lys | Asn | His | His | Lys | Thr |
| | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| 20 | | | | | | | | | | | | | | | 30 |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Lys | Trp | Phe | Val | Pro | Trp | Gly | Pro | Asn | His | Cys | Asp | Lys | Ile | Arg | Asp |
| | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| 35 | | | | | | | | | | | | | | | 45 |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | Glu | Glu | Ala | Ile | Pro | Arg | Glu | Ile | Glu | Ala | Asn | Asp | Ile | Val | Phe |
| | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| 50 | | | | | | | | | | | | | | | 60 |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ser | Val | His | Ile | Pro | Leu | Pro | His | Met | Gly | Asp | Glu | Ser | Leu | Val | Pro |
| | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| 65 | | | | | | | | | | | | | | | 80 |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|

| | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Ile | His | Xaa | Val | Tyr | Pro | Gly | Ser | Trp | Asp | Ile | Ala | Phe | Gln | Ala | Lys |
| | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|
| 85 | | | | | | | | | | | | | | | 95 |
|----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|----|

| | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| Gln | Pro | Asn | Gln | Gly | Lys | Met | Gln | Glu | Val | Ser | Met | Gly | Arg | |
| | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|
| 100 | | | | | | | | | | | | | | | 110 |
|-----|--|--|--|--|--|--|--|--|--|--|--|--|--|--|-----|

(2) INFORMATION FOR SEQ ID NO:52:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 327 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:52:

TCACTCCTAA TCCATGACCA CTGTTTTTT CCTATTTATA TCACCAGGTA GCCTACTGAG 60

TTAATATTTA AGTTGTCNNT GGGTNNGTGT CCCTGTTTG TGGCATAATA TAACTGAATT 120

TCATGNGAAG ATTTATTCCA CCAGGGTAT TTCAGCTTTG AAACCAAATC TGTGTATCTA 180

ATACTAACCA ATCTGTTGGA TGTGGATTTT AAAAATGTT TGCTAAACTA CCCAAGTAAG 240

ATTTACTGTA TTAAATGGCC TTGGGTCTG AAAAGCTTTT TTAAAAAAA AAAAAAAA 300

AAAAAAAAAA AAAAGATCTT TAATTAA

327

(2) INFORMATION FOR SEQ ID NO:53:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 242 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:53:

| | |
|---|-----|
| GCGAAAGGAT TTTAAGGAAC AGATCATCCA CCATGTGCC ACTATCATTC TCCTCTGCTT | 60 |
| CTCCTGGTTT GCCAATTACG TCCGGGCAGG GACCCTCATC ATGGCTCTGC ATGACGCTTC | 120 |
| TGACTACCTG CTGGAGCTG CCAAGATGTT TAACTACGCG GGATGGAAGA ACACCTGCAA | 180 |
| CAACCTCTTC ATTGTGTTCG CCATCGTTT CATCATCACT CGGCTGGTTA TCATGCCTTT | 240 |
| CT | 242 |

(2) INFORMATION FOR SEQ ID NO:54:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 377 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:54:

| | |
|---|-----|
| GAATTCCGGCA CGAGGATTCT CATCAGCTTT TCCTGGTTT GCCAATTACA TCCGAGCTGG | 60 |
| GACTCTAACATC ATGGCTCTGC ATGACTCTTC CGATTACCTG CTGGAKTCAG CCAAGATGTT | 120 |
| TAACTACGCG GGATGGAAGA ACACCTGCAA CAACATCTTC ATCGTCTTCG CCATTGTTT | 180 |
| TATCATCACCG CGACTGGTCA TCCTGCCCTT CTGGATCCTG CATTGCACCC TGGGTGTACC | 240 |
| CACTGGAGCT CTATCCTGCC TTCTTGGGC TATTACTTCT TTCAATTCCA TGATGGAGT | 300 |
| TCTACAGCTG CTGCATATCT TCTGGGSCTA CCTCATTTCG CGSATGGGCC CACAAGTTCA | 360 |
| TAACTGGGAA AGCTGGT | 377 |

(2) INFORMATION FOR SEQ ID NO:55:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 102 amino acids
- (B) TYPE: amino acid
- (C) STRANDEDNESS:

(D) TOPOLOGY: linear
 (ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:55:

```

Met Ala Leu His Asp Ser Ser Asp Tyr Leu Leu Xaa Ser Ala Lys Met
1           5           10          15

Phe Asn Tyr Ala Gly Trp Lys Asn Thr Cys Asn Asn Ile Phe Ile Val
20          25          30

Phe Ala Ile Val Phe Ile Ile Thr Arg Leu Val Ile Leu Pro Phe Trp
35          40          45

Ile Leu His Cys Thr Leu Gly Val Pro Thr Gly Ala Leu Ser Cys Leu
50          55          60

Leu Trp Ala Ile Thr Ser Phe Asn Ser Met Met Gly Val Leu Gln Leu
65          70          75          80

Leu His Ile Phe Trp Xaa Tyr Leu Ile Leu Arg Met Gly Pro Gln Val
85          90          95

His Asn Trp Glu Ser Trp
100

```

(2) INFORMATION FOR SEQ ID NO:56:

(i) SEQUENCE CHARACTERISTICS:
 (A) LENGTH: 369 base pairs
 (B) TYPE: nucleic acid
 (C) STRANDEDNESS: double
 (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:56:

```

AAAAAGTGGG GGCTGTACTG GGGACTGCTC GGATGATNTT TNTTAGTGT ACTTTTTCA      60
GCTGTCCCTG TAGCGACAGG TNTAAGATCT GACTGCCTCC TTTTTNTGGC NTCTCCCCC      120
TTCCNTNTTC TCTTCAGNTA GGCTAGCTGG TTTGGAGTAG AATGGCAACT AATTNTAAATT    180
TTTATTTATT AAATATTTGG GGTTTTGGTT TAAAGCCAG AATTACGGNT AGCACCTAGC    240
ATTCNGCAG AGGGACCATT TTNGACCNAAT ATNTANTNTT NATGGGTTTT TTTTAAAT      300
TNAAAGATTA ATNNNAAAT ATAAAATAAA AAAAAAAAAA AAAAAAAAAA AAAAAAAAAAG    360
CGCGGCCGC                                         369

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(2) INFORMATION FOR SEQ ID NO:57:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 423 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:57:

| | |
|---|-----|
| GAATTCCGCA CGNNNTGNAA TATAAAAATT TATTTTAAG TCAAAGTATC CAACAAATAA | 60 |
| ACCTACAGAA AACATTTCC CATCACAAATC TGTTGCTTTA CCAAATAATA TTTTGAAAAC | 120 |
| ACATTCCTTC AGTCATTATA AAGTTCTTAA AATACAAAAG AAATTAATTC TGTAAGAAAAG | 180 |
| TCTAGTAGAC CAGATGCTGT TGTCAAGACT TGTATGTTGG TGTTTTGCT TTCAGTACAT | 240 |
| CCCACGCCAT CCACCTCCAC TYCATGCCGC CTTGCCATA GTAACCTCCA CTGCCCTCCAC | 300 |
| CACCACGGCC ATAACCACCC AAACCATCAG GAGTACCATATA TCCTCCACTG TAATTGTTCC | 360 |
| CCATTCCCAT TCTTCCAAT GGATTCATA GGCCYTCCT GGATTATTT TNAAAAGGAA | 420 |
| AAA | 423 |

(2) INFORMATION FOR SEQ ID NO:58:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 76 amino acids
 - (B) TYPE: amino acid
 - (C) STRANDEDNESS:
 - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:58:

| | | | |
|---|----|----|----|
| Met Leu Leu Ser Arg Leu Val Cys Trp Cys Phe Cys Phe Gln Tyr Ile | | | |
| 1 | 5 | 10 | 15 |
| Pro Arg His Pro Pro Pro Leu His Ala Ala Leu Pro Ile Val Thr Ser | | | |
| 20 | 25 | 30 | |
| Thr Ala Ser Thr Thr Ala Ile Thr Thr Gln Thr Ile Arg Ser Thr | | | |
| 35 | 40 | 45 | |
| Ile Ser Ser Thr Val Ile Val Pro His Ser His Ser Ser Asn Trp Ile | | | |
| 50 | 55 | 60 | |
| Pro Xaa Ala Xaa Pro Gly Leu Phe Xaa Lys Arg Lys | | | |
| 65 | 70 | 75 | |

(2) INFORMATION FOR SEQ ID NO:59:

- (i) SEQUENCE CHARACTERISTICS:
 - (A) LENGTH: 294 base pairs

(B) TYPE: nucleic acid
(C) STRANDEDNESS: double
(D) TOPOLOGY: linear

(ii) MOLECULE TYPE: cDNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:59:

| | | | | | | |
|------------|------------|------------|------------|------------|------------|-----|
| TAAAAAACCC | TTTTCCCTCN | TANGGTNTA | TCATAGGGTC | CCGGTNGCTG | TCCCAGCAAT | 60 |
| TTTNTNGGNG | GATCATAAAA | TCCTTNGATT | TNACTCGTGA | NANTTGNAAA | GATCTCAATA | 120 |
| TACCTATTAA | AAAATGTTT | AAGGTACAGG | TTTCAGCATA | AATGTATTAG | TGTAAATTAG | 180 |
| ATACNGGGCA | AAATGCAGTA | AGTTTTNTA | TATNTAGATA | CATAACCCAA | TTTAAATTGC | 240 |
| CTAAATACAC | CGTAAGTTAA | CAGTTAAC | CTACAAACTT | AATTAAGCGG | CCGC | 294 |

What is claimed is:

1. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:
 - (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:1;
 - (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:1 from nucleotide 70 to nucleotide 505;
 - (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AP162 deposited under accession number ATCC 98026 ;
 - (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AP162 deposited under accession number ATCC 98026 ;
 - (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AP162 deposited under accession number ATCC 98026 ;
 - (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AP162 deposited under accession number ATCC 98026 ;
 - (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:2;
 - (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:2 having biological activity;
 - (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
 - (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.
2. The composition of claim 1, further comprising a pharmaceutically acceptable carrier.
3. A method for preventing, treating or ameliorating a medical condition which comprises administering to a mammalian subject a therapeutically effective amount of a composition of claim 2.

4. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:2;
- (b) the amino acid sequence of SEQ ID NO:2 from amino acid 42 to amino acid 61;
- (c) fragments of the amino acid sequence of SEQ ID NO:2; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AP162 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

5. The composition of claim 4, wherein said protein comprises the amino acid sequence of SEQ ID NO:2.

6. The composition of claim 4, wherein said protein comprises the amino acid sequence of SEQ ID NO:2 from amino acid 42 to amino acid 61.

7. The composition of claim 2, further comprising a pharmaceutically acceptable carrier.

8. A method for preventing, treating or ameliorating a medical condition which comprises administering to a mammalian subject a therapeutically effective amount of a composition of claim 7.

9. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:4;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:4 from nucleotide 230 to nucleotide 791;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:4 from nucleotide 311 to nucleotide 791;

- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AM931 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AM931 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AM931 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AM931 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:5;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:5 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

10. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:5;
- (b) the amino acid sequence of SEQ ID NO:5 from amino acid 32 to amino acid 51;
- (c) fragments of the amino acid sequence of SEQ ID NO:5; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AM931 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

11. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:6;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:6 from nucleotide 14 to nucleotide 491;

- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:6 from nucleotide 83 to nucleotide 491;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AM610 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AM610 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AM610 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AM610 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:7;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:7 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

12. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:7;
- (b) the amino acid sequence of SEQ ID NO:7 from amino acid 31 to amino acid 50;
- (c) fragments of the amino acid sequence of SEQ ID NO:7; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AM610 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

13. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:9;

- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:9 from nucleotide 1 to nucleotide 483;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AM340 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AM340 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AM340 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AM340 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:10;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:10 having biological activity;
- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

14. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:10;
- (b) the amino acid sequence of SEQ ID NO:10 from amino acid 124 to amino acid 143;
- (c) fragments of the amino acid sequence of SEQ ID NO:10; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AM340 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

15. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:11;

- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:11 from nucleotide 15 to nucleotide 462;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:11 from nucleotide 87 to nucleotide 462;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AM282 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AM282 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AM282 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AM282 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:12;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:12 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

16. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:12;
- (b) the amino acid sequence of SEQ ID NO:12 from amino acid 28 to amino acid 47;
- (c) fragments of the amino acid sequence of SEQ ID NO:12; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AM282 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

17. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:14;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:14 from nucleotide 185 to nucleotide 519;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:14 from nucleotide 260 to nucleotide 519;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AK647 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AK647 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AK647 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AK647 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:15;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:15 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

18. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:15;
- (b) the amino acid sequence of SEQ ID NO:15 from amino acid 27 to amino acid 46;
- (c) fragments of the amino acid sequence of SEQ ID NO:15; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AK647 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

19. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:17;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:17 from nucleotide 257 to nucleotide 536;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:17 from nucleotide 329 to nucleotide 536;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AK583 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AK583 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AK583 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AK583 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:18;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:18 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

20. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:18;
- (b) the amino acid sequence of SEQ ID NO:18 from amino acid 14 to amino acid 33;
- (c) fragments of the amino acid sequence of SEQ ID NO:18; and

(d) the amino acid sequence encoded by the cDNA insert of clone AK583 deposited under accession number ATCC 98026; the protein being substantially free from other mammalian proteins.

21. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:20;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:20 from nucleotide 179 to nucleotide 476;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AK533 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AK533 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AK533 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AK533 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:21;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:21 having biological activity;
- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

22. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:21;
- (b) the amino acid sequence of SEQ ID NO:21 from amino acid 35 to amino acid 57;
- (c) fragments of the amino acid sequence of SEQ ID NO:21; and

(d) the amino acid sequence encoded by the cDNA insert of clone AK533 deposited under accession number ATCC 98026;
the protein being substantially free from other mammalian proteins.

23. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:23;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:23 from nucleotide 220 to nucleotide 612;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:23 from nucleotide 328 to nucleotide 612;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AK296 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AK296 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AK296 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AK296 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:24;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:24 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

24. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:24;

- (b) the amino acid sequence of SEQ ID NO:24 from amino acid 81 to amino acid 90;
- (c) fragments of the amino acid sequence of SEQ ID NO:24; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AK296 deposited under accession number ATCC 98026;
the protein being substantially free from other mammalian proteins.

25. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:26;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:26 from nucleotide 58 to nucleotide 655;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone H617 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone H617 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone H617 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone H617 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:27;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:27 having biological activity;
- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

26. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:27;

- (b) the amino acid sequence of SEQ ID NO:27 from amino acid 65 to amino acid 84;
 - (c) fragments of the amino acid sequence of SEQ ID NO:27; and
 - (d) the amino acid sequence encoded by the cDNA insert of clone H617 deposited under accession number ATCC 98026;
- the protein being substantially free from other mammalian proteins.

27. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:29;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:29 from nucleotide 14 to nucleotide 391;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone BB9 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone BB9 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone BB9 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone BB9 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:30;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:30 having biological activity;
- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

28. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:30;
- (b) the amino acid sequence of SEQ ID NO:30 from amino acid 75 to amino acid 94;

(c) fragments of the amino acid sequence of SEQ ID NO:30; and
(d) the amino acid sequence encoded by the cDNA insert of clone BB9 deposited under accession number ATCC 98026;
the protein being substantially free from other mammalian proteins.

29. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:32;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:32 from nucleotide 61 to nucleotide 514;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:32 from nucleotide 115 to nucleotide 514;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AW191 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AW191 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AW191 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AW191 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:33;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:33 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

30. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:33;

- (b) the amino acid sequence of SEQ ID NO:33 from amino acid 24 to amino acid 43;
- (c) fragments of the amino acid sequence of SEQ ID NO:33; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AW191 deposited under accession number ATCC 98026;
the protein being substantially free from other mammalian proteins.

31. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:35;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:35 from nucleotide 180 to nucleotide 525;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:35 from nucleotide 339 to nucleotide 525;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AT211 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AT211 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AT211 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AT211 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:36;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:36 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

32. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:36;
- (b) the amino acid sequence of SEQ ID NO:36 from amino acid 1 to amino acid 20;
- (c) fragments of the amino acid sequence of SEQ ID NO:36; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AT211 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

33. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:38;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:38 from nucleotide 225 to nucleotide 677;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:38 from nucleotide 390 to nucleotide 677;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AT205 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AT205 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AT205 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AT205 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:39;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:39 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and

(k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

34. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:39;
- (b) the amino acid sequence of SEQ ID NO:39 from amino acid 6 to amino acid 25;
- (c) fragments of the amino acid sequence of SEQ ID NO:39; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AT205 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

35. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:40;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:40 from nucleotide 128 to nucleotide 508;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:40 from nucleotide 200 to nucleotide 508;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AS34 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AS34 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AS34 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AS34 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:41;
- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:41 having biological activity;

- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

36. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:41;
- (b) the amino acid sequence of SEQ ID NO:41 from amino acid 27 to amino acid 46;
- (c) fragments of the amino acid sequence of SEQ ID NO:41; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AS34 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

37. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:43;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:43 from nucleotide 23 to nucleotide 676;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AS32 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AS32 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AS32 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AS32 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:44;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:44 having biological activity;

- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

38. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:44;
- (b) the amino acid sequence of SEQ ID NO:44 from amino acid 78 to amino acid 97;
- (c) fragments of the amino acid sequence of SEQ ID NO:44; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AS32 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

39. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:46;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:46 from nucleotide 132 to nucleotide 479;
- (c) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:46 from nucleotide 201 to nucleotide 479;
- (d) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AR260 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AR260 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AR260 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AR260 deposited under accession number ATCC 98026 ;
- (h) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:47;

- (i) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:47 having biological activity;
- (j) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(g) above; and
- (k) a polynucleotide which encodes a species homologue of the protein of (h) or (i) above.

40. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:47;
- (b) the amino acid sequence of SEQ ID NO:47 from amino acid 40 to amino acid 59;
- (c) fragments of the amino acid sequence of SEQ ID NO:47; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AR260 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

41. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:50;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:50 from nucleotide 1 to nucleotide 332;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone K640 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone K640 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone K640 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone K640 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:51;

- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:51 having biological activity;
- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

42. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:51;
- (b) the amino acid sequence of SEQ ID NO:51 from amino acid 11 to amino acid 30;
- (c) fragments of the amino acid sequence of SEQ ID NO:51; and
- (d) the amino acid sequence encoded by the cDNA insert of clone K640 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

43. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:54;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:54 from nucleotide 71 to nucleotide 377;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone K39 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone K39 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone K39 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone K39 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:55;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:55 having biological activity;

- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

44. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:55;
- (b) the amino acid sequence of SEQ ID NO:55 from amino acid 62 to amino acid 81;
- (c) fragments of the amino acid sequence of SEQ ID NO:55; and
- (d) the amino acid sequence encoded by the cDNA insert of clone K39 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

45. A composition comprising an isolated protein encoded by a polynucleotide selected from the group consisting of:

- (a) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:57;
- (b) a polynucleotide comprising the nucleotide sequence of SEQ ID NO:57 from nucleotide 194 to nucleotide 423;
- (c) a polynucleotide comprising the nucleotide sequence of the full length protein coding sequence of clone AT319 deposited under accession number ATCC 98026 ;
- (d) a polynucleotide encoding the full length protein encoded by the cDNA insert of clone AT319 deposited under accession number ATCC 98026 ;
- (e) a polynucleotide comprising the nucleotide sequence of the mature protein coding sequence of clone AT319 deposited under accession number ATCC 98026 ;
- (f) a polynucleotide encoding the mature protein encoded by the cDNA insert of clone AT319 deposited under accession number ATCC 98026 ;
- (g) a polynucleotide encoding a protein comprising the amino acid sequence of SEQ ID NO:58;
- (h) a polynucleotide encoding a protein comprising a fragment of the amino acid sequence of SEQ ID NO:58 having biological activity;

- (i) a polynucleotide which is an allelic variant of a polynucleotide of (a)-(f) above; and
- (j) a polynucleotide which encodes a species homologue of the protein of (g) or (h) above.

46. A composition comprising a protein, wherein said protein comprises an amino acid sequence selected from the group consisting of:

- (a) the amino acid sequence of SEQ ID NO:58;
- (b) the amino acid sequence of SEQ ID NO:58 from amino acid 2 to amino acid 21;
- (c) fragments of the amino acid sequence of SEQ ID NO:58; and
- (d) the amino acid sequence encoded by the cDNA insert of clone AT319 deposited under accession number ATCC 98026;

the protein being substantially free from other mammalian proteins.

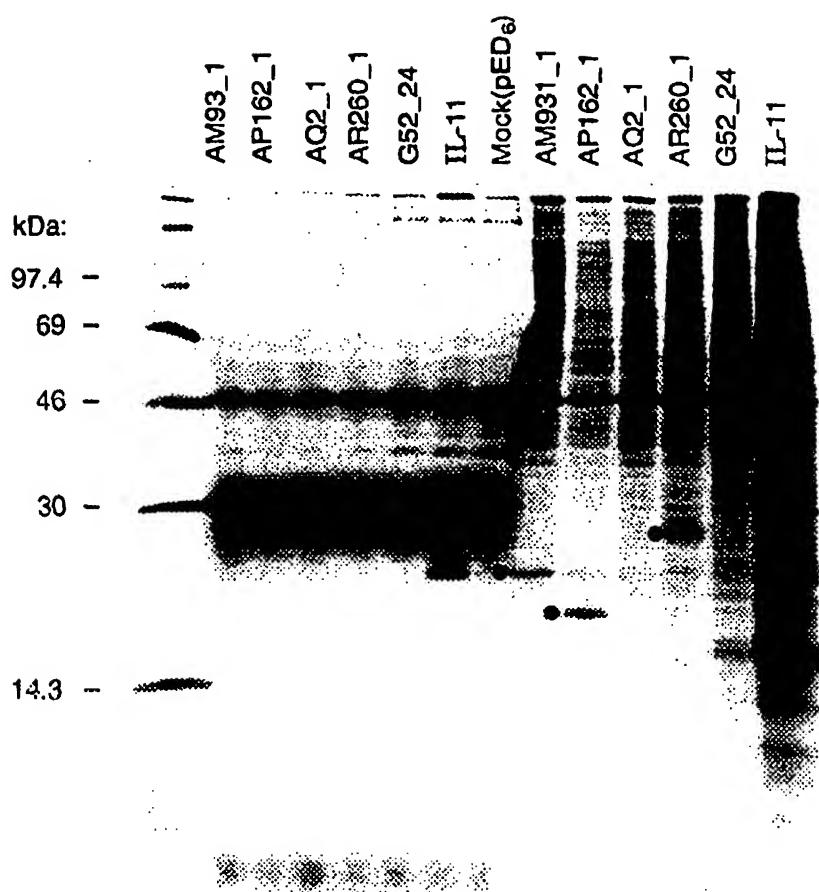


Fig. 1
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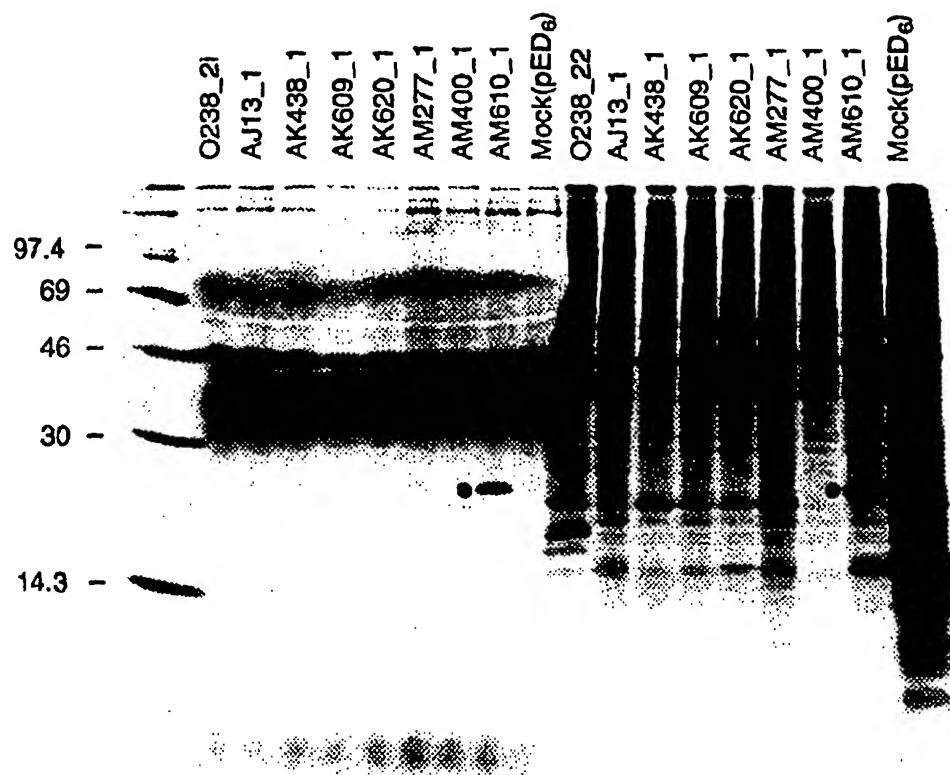


Fig. 2
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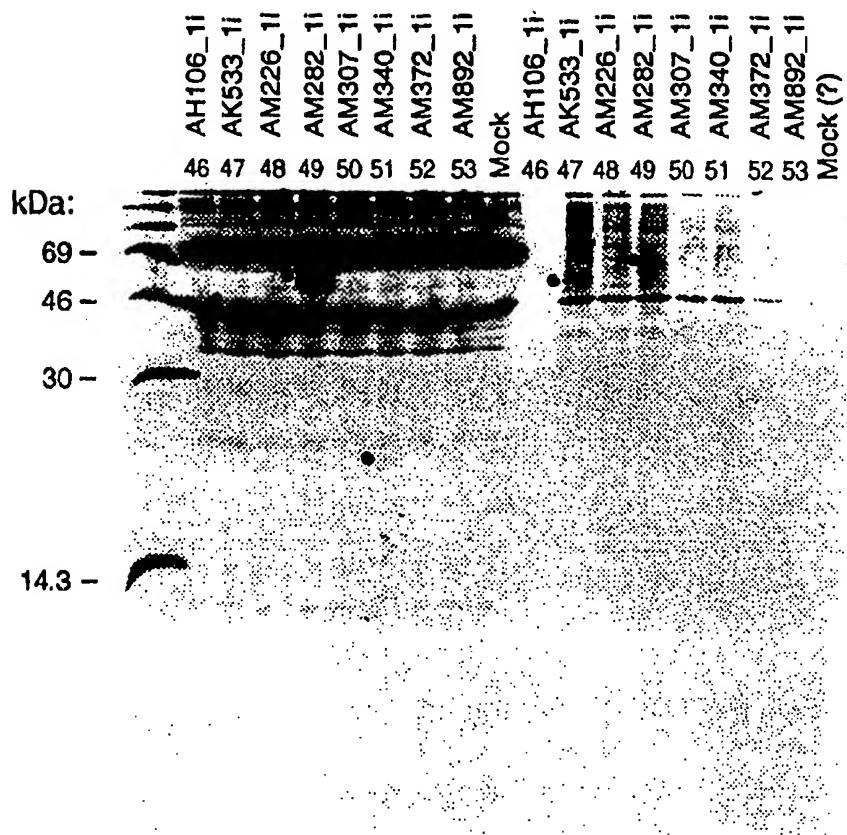


Fig. 3

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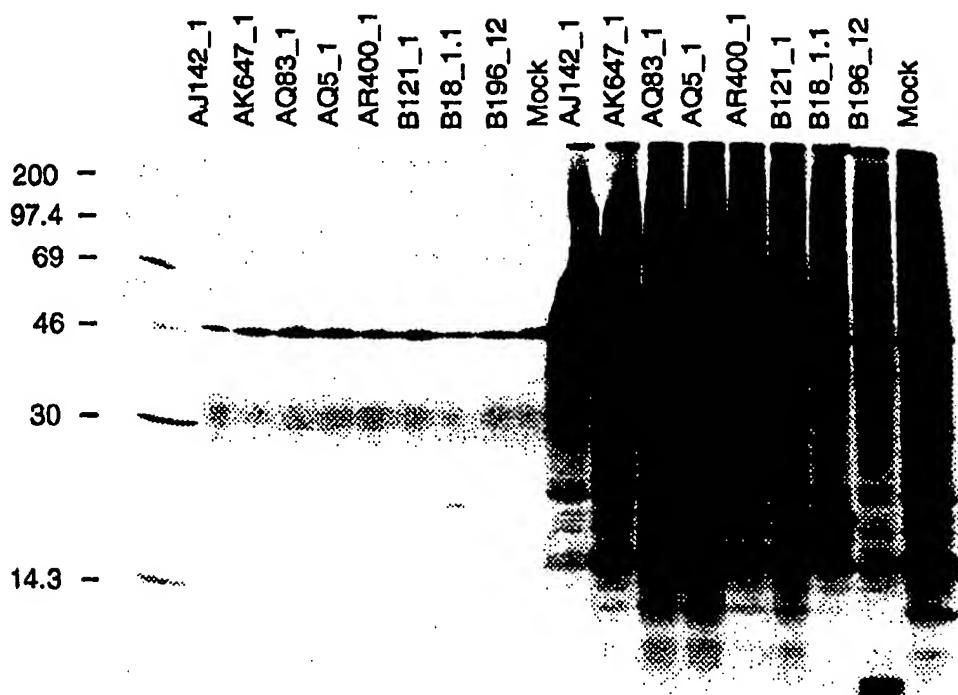


Fig. 4

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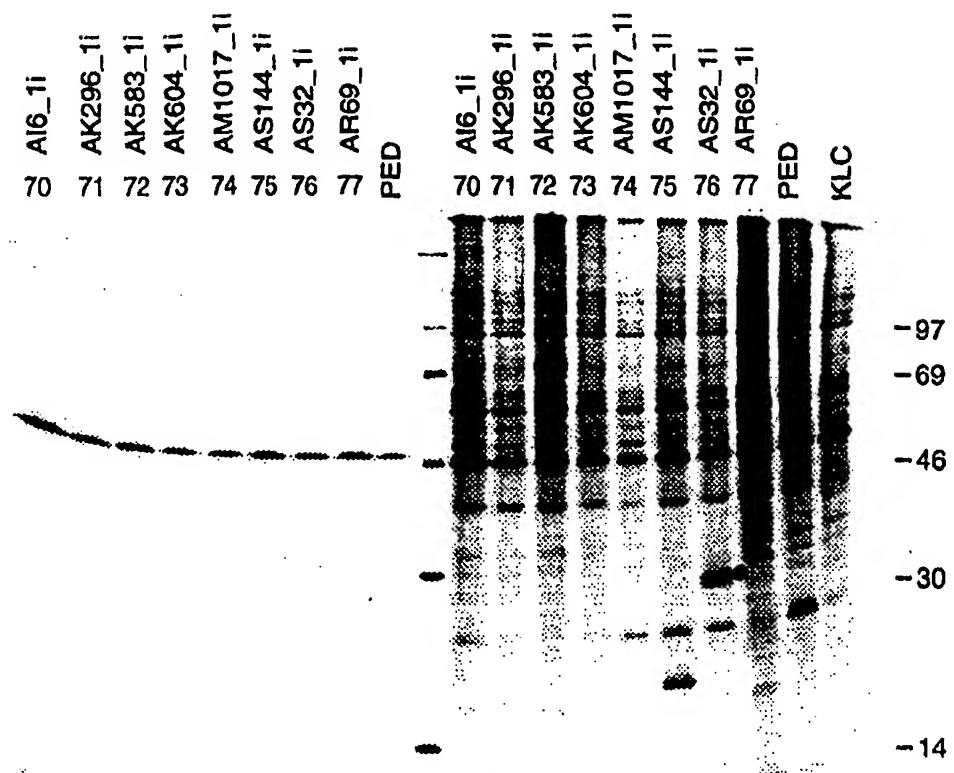


Fig. 5
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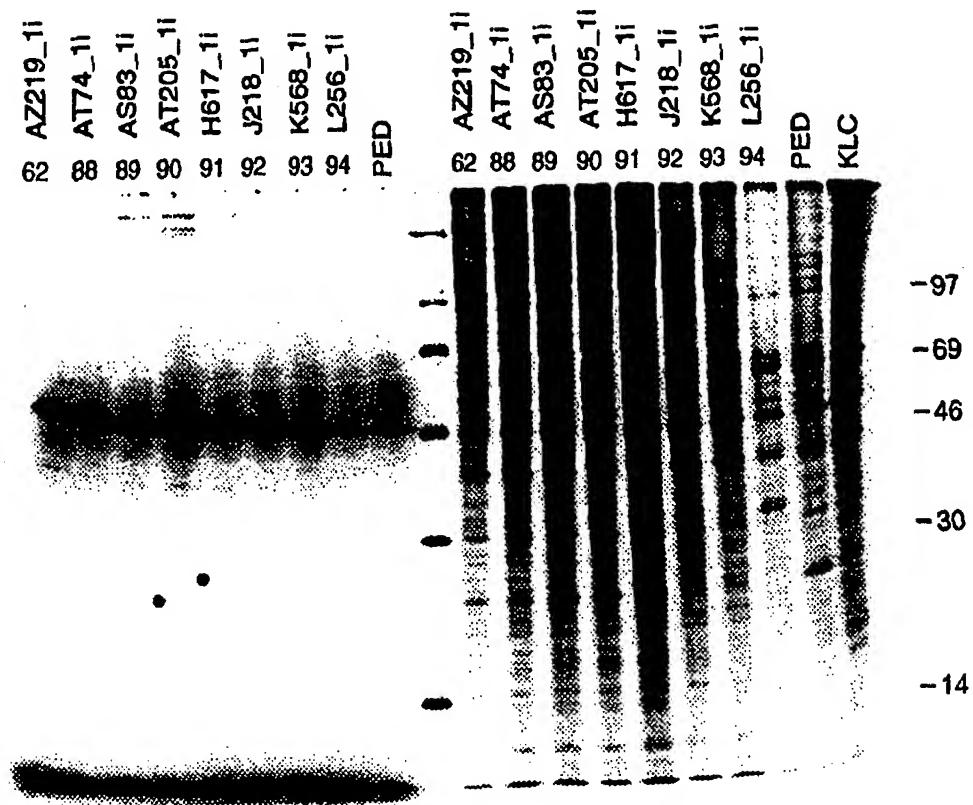


Fig. 6
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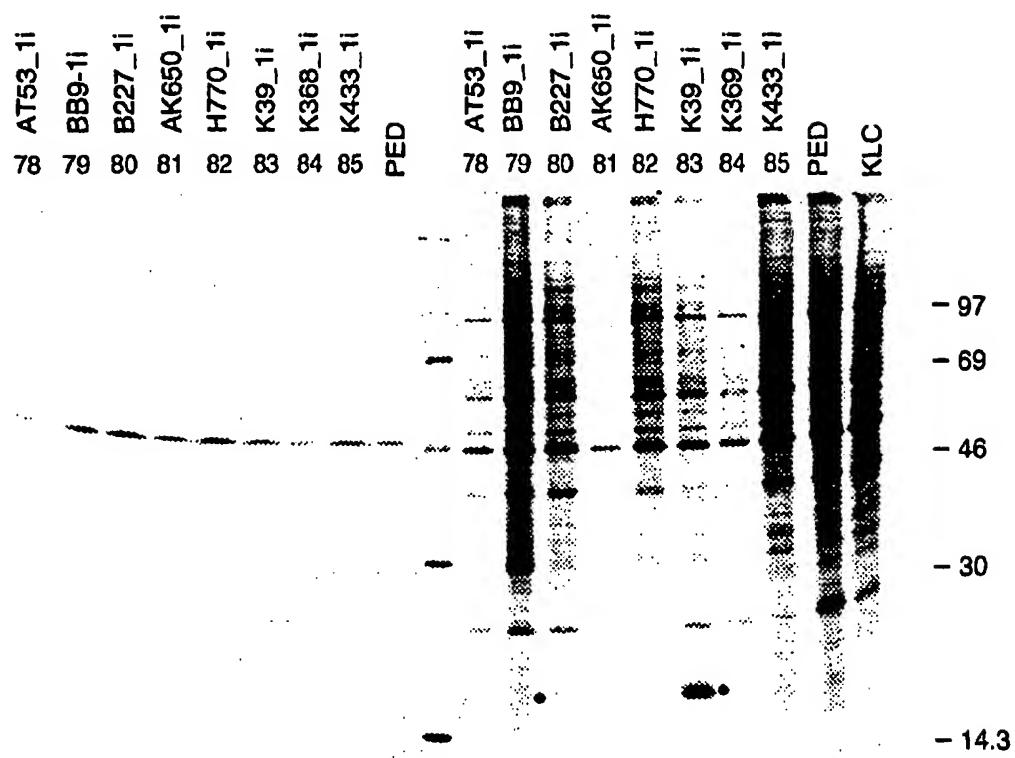


Fig. 7

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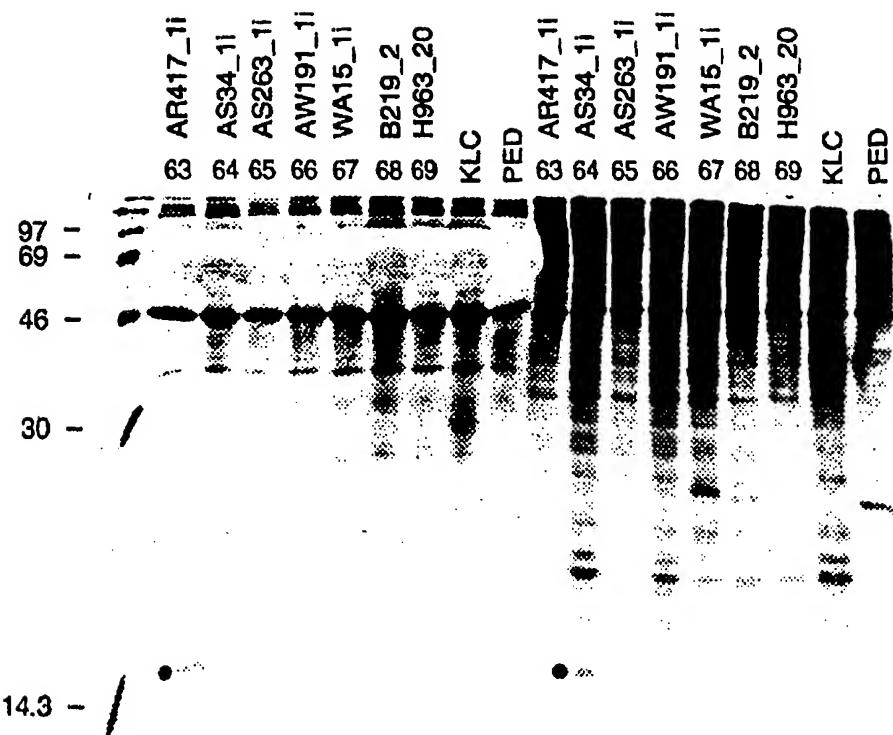


Fig. 8
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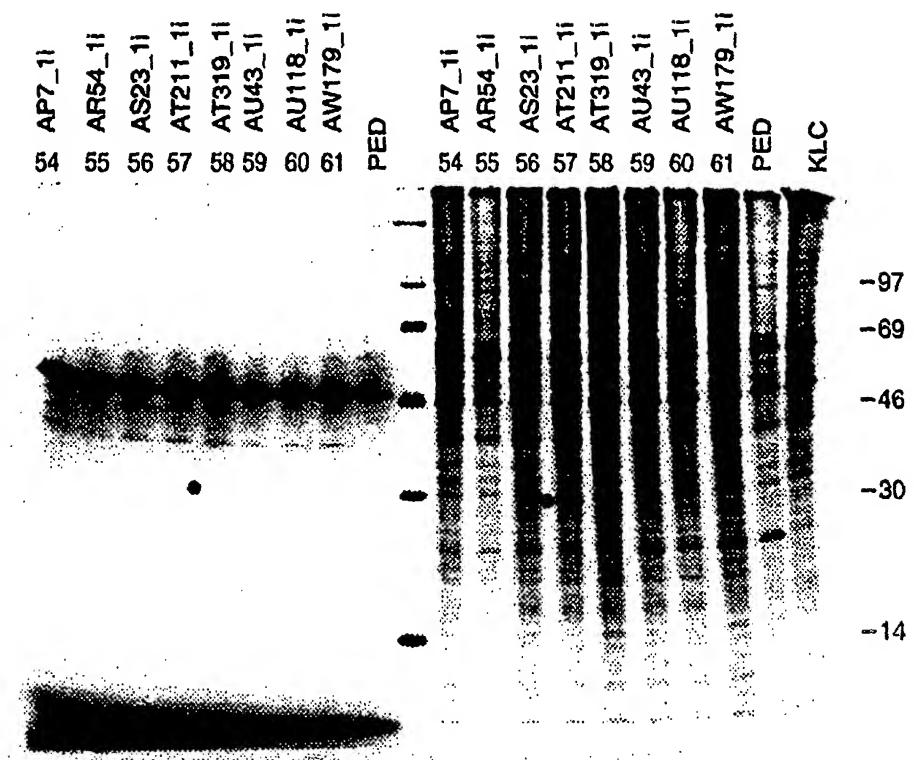
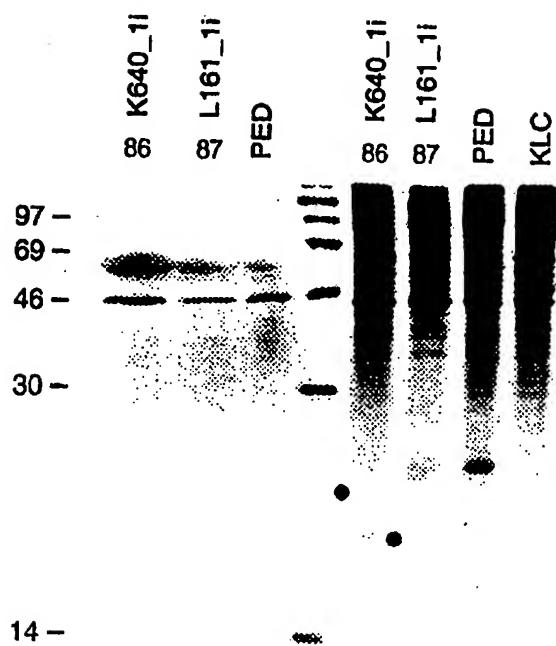


Fig. 9
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Fig. 10
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